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(U.S.) Environmental Protection Agency
Atlanta, GA

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United States
Environmental Protection
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Region 4
345 Courtland Street, NE
Atlanta, GA 30365

EPA 904/9-81-078B
September 1981

EPA

Environmental Impact Statement

Draft

Central Hillsborough County - Tampa Area, Florida

Alternatives Evaluation Technical Reference Document

Vol. II

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SPRINGFIELD, VA 22161

CENTRAL HILLSBOROUGH COUNTY - TAMPA, FLORIDA
201 FACILITIES PLAN

ENVIRONMENTAL IMPACT STATEMENT
ALTERNATIVES DEVELOPMENT AND EVALUATION
TECHNICAL REFERENCE DOCUMENT, VOLUME II

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA 30365

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TECHNICAL REFERENCE DOCUMENT
VOLUME II
ALTERNATIVES DEVELOPMENT AND EVALUATION

The purpose of this volume is to provide a systematic development of all reasonable alternatives for the attainment of the objectives of this project. These alternatives are compared in order to identify critical differences between the alternatives with the aim of selecting an alternative which is the most cost-effective, environmentally-sound, and socially acceptable.

The following sections will discuss and describe the private and public systems which are generally considered available and suitable for the treatment and disposal of wastewater, the methods for assimilating and screening of the alternatives considered, and the processes through which governmental and public interaction and input was secured. The final sections of this chapter will describe and evaluate the alternatives selected for further review and provide a ranking of the alternatives considered.

The selection of a viable alternative to adequately transmit, treat and dispose of wastewater generated within the planning area is an important but complex task. The information presented in this section is of necessity a summary of the alternatives selection process.

II.1 GENERAL DESCRIPTION OF COLLECTION, TREATMENT, AND DISPOSAL SYSTEMS ALTERNATIVES

There are two generally acceptable subdivisions of collection, treatment and disposal of wastewater alternatives: individual systems and public systems.

II.1.1 Individual Systems

The individual system collection, treatment and disposal alternatives include septic tanks, seepage ponds and privys. Of these, the septic system is the most widely employed and acceptable in the planning area.

The acceptability of all of these individual systems is a function of water table elevation and soil conditions. Their obvious advantages are low energy consumption and low cost of operation. The major disadvantages of these systems are the potential for contamination of ground water and possibly, surface water by pollutants, both biological and chemical.

II.1.2 Public Systems

Public systems to collect, treat and dispose of wastewater contain many subsystems and alternatives.

A. COLLECTION: Wastewater is collected and transported to treatment plants by gravity (sewers) and by pumping through force mains which require pumping stations be at strategic locations.

B. TREATMENT: The three main types of treatment plants which exist are known as primary, secondary and advanced wastewater treatment (AWT). Primary treatment essentially removes those pollutants which will either settle (heavier suspended solids) or float (such as grease). Primary treatment will typically remove about 60 percent of the raw sewage suspended solids resulting in an approximately 35 percent reduction of the biological oxygen demand (BOD). Federal law requires a higher degree of treatment.

Secondary treatment removes the soluble BOD. This is typically achieved by using biological processes similar to those which occur in nature. In secondary treatment these processes are enhanced so that the breakdown of the degradeable organic pollutants can be achieved quickly. Secondary treatment removes suspended solids as well as approximately 85 percent of the BOD. Not removed are significant amounts of nitrogen, phosphorus, carbon oxygen demand (COD), or heavy metals, nor does secondary treatment completely remove pathogenic bacteria and viruses.

In cases where secondary levels of treatment are not adequate, additional treatment processes are applied to the secondary effluent to further remove pollutants from the wastewater effluent. These processes are known as advanced wastewater treatment (AWT). Some of the AWT processes may involve chemical treatment and filtration of the wastewater or they may involve applying the secondary effluent to the land in carefully designed irrigation systems.

AWT processes can remove as much as 99 percent of the BOD and phosphorus, all suspended solids and bacteria and 95 percent of the nitrogen. The effluent is clean, colorless and odorless.

C. DISPOSAL: Products from the wastewater treatment facilities include the effluent (treated wastewater) and sludge (collected solids). A number of disposal methods are discussed on the following pages.

1. Effluent. The method of discharging the effluent is dependent upon the existing water quality of the stream or water body which is to receive it. Typical effluent disposal methods or alternative methods in use are; a) surface-water discharge, b) land application, c) deep well injection, d) a combination of the above and e) reuse.

   a. Surface-Water Discharge

   Direct or indirect methods of effluent discharge to streams, rivers, bays and lakes are the most common methods of effluent disposal currently in use. Theoretically, these water bodies have an assimilative capacity which is determined by a set of complex factors which include temperature, current velocity and volume. Measurement of the quality of these water bodies gives an indication as to whether or not their assimilative capacity has been reached.

b. Land Application

Land application has several advantages. It serves a dual purpose of disposal and recycling of water and wastes in the final treatment steps and can aid in the reclamation and reuse of water resources, recharge of ground-water aquifers, reclamation of marginal land, as well being a means of the preserving open spaces for future green belts. Four major types of land application methods of effluent disposal are available: 1) slow rate, 2) rapid infiltration, 3) overland flow and 4) wetlands application. Each of these methods is briefly described below.

i. Slow rate process - This method is often referred to as the "irrigation process". In slow rate systems vegetation is a critical component for managing water and nutrients. Slow rate land treatment systems use both surface and sprinkler application techniques. Surface application includes ridge-and-furrow and border flooding techniques. Sprinkler application is applied to the impact sprinkler method of water application. Slow rate systems encourage water conservation by replacing potable water uses for irrigating landscaped area and by recharging ground-water supplies.

ii. Rapid Infiltration - In this process wastewater is applied to permeable soils and is treated as it percolates through. Most of the treated effluent eventually reaches the ground water. Seldom is vegetation used to enhance the treatment. Rapid recovery or recharge of ground or surface-water supplies can be achieved with this method and the removal of some wastewater constituents by the filtering and chemical action of the soil is excellent.

iii. Overland Flow - Wastewater is applied over the upper reaches of sloped terraces and allowed to flow across the vegetated surface to runoff collection ditches. Treatment of the wastewater is accomplished by physical, chemical, and biological means as the thin film of water flows down relatively impermeable slopes. This method is useful in areas which have high relief and impermeable soils.

iv. Wetlands - The application of secondary effluent to existing fresh water and salt water wetlands, is being studied in a number of states. The ability of the natural systems to remove pollutants from treated effluent holds promise as an emerging technology for wastewater management. Management techniques for nutrient removal, loading rates, climatic constraints and suitable site characteristics are being studied at several locations. One disadvantage is that overloading of the system by a malfunctioning treatment plant would pollute surface and ground waters. The recovery time of a damaged system is thought to be extensive.

c. Deep Well Injection (DWI)

This process refers to the discharge of treated effluent into deep, low quality ground-water zones. Sufficient treatment of the wastewater is essential to minimize clogging of the pores in the aquifer into which the injection takes place. The treated wastewater is forced into the deep aquifer by use of injection wells. Extensive site specific testing and monitoring are necessary to evaluate the suitability of an aquifer for deep well injection of treated wastewater.

d. Combinations

In some areas, physical constraints preclude the use of a single system. For example, the volumes of treated wastewater which need to be disposed of may be greater than suitable for either land application or DWI methods. It is possible that a combination of spray irrigation and DWI may be practical.

e. Reuse

The reuse of treated effluent depends upon the quality or level of treatment. A number of reuses are possible such as for power plant or other industrial cooling.

2. Sludge. In the process of purifying the wastewater a sludge is created. The higher the degree of wastewater treatment, the greater the residue of sludge created. The sludge is produced from materials settled from the raw wastewater such as rags, sticks and organic solids - and of solids generated in the wastewater treatment process-such as the excess activated sludge created by aeration. Initially the sludges withdrawn from the treatment process are mostly water. Thickening and digestion

processes further dewater the sludge and stabilize the organic solids so that they may be handled or used as soil conditioners without causing a nuisance or health hazard. The sludge is ultimately disposed on air, land or water. In general the disposal of sludge in the ocean or gulf is discouraged. Air pollution considerations eliminate many sludge incinerator processes. Most sludge is returned to the land either in landfills or as a form of soil conditioner.

II.2 DEVELOPMENT OF ALTERNATIVES

The alternatives analyzed included those developed by the 201 Consultants, Greeley & Hansen and Smith & Gillespie, and the Environmental Consultant, Dames & Moore, as well as additional alternatives proposed by the community, state and federal agencies, and the EPA project office. The 201 Consultants were responsible for evaluating the cost, reliability and implementability of the alternatives. The environmental comparisons were the responsibility of Dames & Moore.

In developing the alternatives, controlling factors such as, soil type, aquifer characteristics, and topography within the study area had to be identified. These criteria (which were developed in the Technical Reference Document, Volume I, Existing Environment) determined the location and suitability of various collection and disposal methods for each study area. For instance, in locating collection routes, the 201 Consultants reviewed the habitat maps in an attempt to avoid routing collection systems through sensitive areas.

The development of alternatives for the collection, treatment, and disposal of the wastewater generated in the planning area involved the interaction of public, private and government agencies. The 201 Consultants, Greeley & Hansen and Smith & Gillespie, working in conjunction with the Environmental Consultant, Dames & Moore, developed a preliminary listing of alternatives which were presented to representatives of various public interest groups for comment and review. Care was taken to include representatives of both "commercial" and "environmental" interest groups. Following this presentation the alternatives were presented to the Florida Department of Environmental Regulation (DER) for their review evaluation and input.

The inventory of the existing physical, chemical and biological conditions of the Planning Area, Technical Reference Document, Volume I, provided a basis for development of the alternatives. For instance, the detailed soils maps were utilized to define areas suitable and unsuitable for septic systems and for land application of wastewater effluent.

Geologic and hydrologic data indicated potential areas for deep well injection of wastewater effluent. For example, saltwater intrusion along the coastal zone of Tampa Bay has contaminated the Floridan Aquifer while the zone further inland is utilized for potable water supply. In order to avoid pollution of potable ground-water supplies, potential injection zones further inland must be located at much greater depths.

Habitat sensitivity maps served as guides to routing of collection systems so that impact to biological communities could be minimized. A number of potentially sensitive routes, especially along the Hillsborough River, were avoided during the preliminary screening of alternatives. These factors and others such as karst terrain and the water quality of the planning area were considered during the development and preliminary screening of alternatives. In this way, the baseline inventory was used as a basis for preliminary screening of alternatives in order to eliminate those which were technically and environmentally unsound.

II.3 ALTERNATIVES SELECTED FOR REVIEW

Following the preliminary screening and review by local, state, and federal agencies as well as interested citizens, a number of alternatives were selected for detailed review and evaluation for environmental acceptability, cost and implementability. These alternatives are briefly described in the following sections. For a more detailed engineering description of the structural alternatives the reader is directed to the 201 Facilities Plan and Study Memorandum Number 8 of this Plan.

II.3.1 No Action Alternative

One of the key alternatives which must be considered for evaluation is the No Action Alternative. The No Action Alternative as developed contains a number of assumptions summarized as follows:

1. Growth will continue to occur in the Planning Area.
2. The existing city and county facilities for the treatment and disposal of wastewater will continue to serve the population. The same ratio of small package plants and septic systems will continue.
3. The existing Tampa advanced wastewater treatment plant will continue to serve the Tampa Service Area and the same portions of the County Service Area.
4. Financing for relief facilities for the Tampa Service Area will be the burden of local government.

The current methods of treatment and disposal of wastewater and the condition of the existing facilities to handle the current and projected wastewater flows are discussed in detail in Section 3 of the 201 Facility Plan and in Study Memorandum Number 6 of this Plan.

II.3.2 Structural Alternatives

The following section briefly describes the structural alternatives which have been developed for the Tampa and the County Service

Areas. More detailed descriptions of these alternatives can be found in Study Memorandum Number 8 of the 201 Facilities Plan.

A. TAMPA SERVICE AREA: The basic premise of the plan is that the unsewered portions of the Tampa Service Area will require sewer service by the year 2000. It is the intent of the systems and relief facilities evaluated to respond to this need.

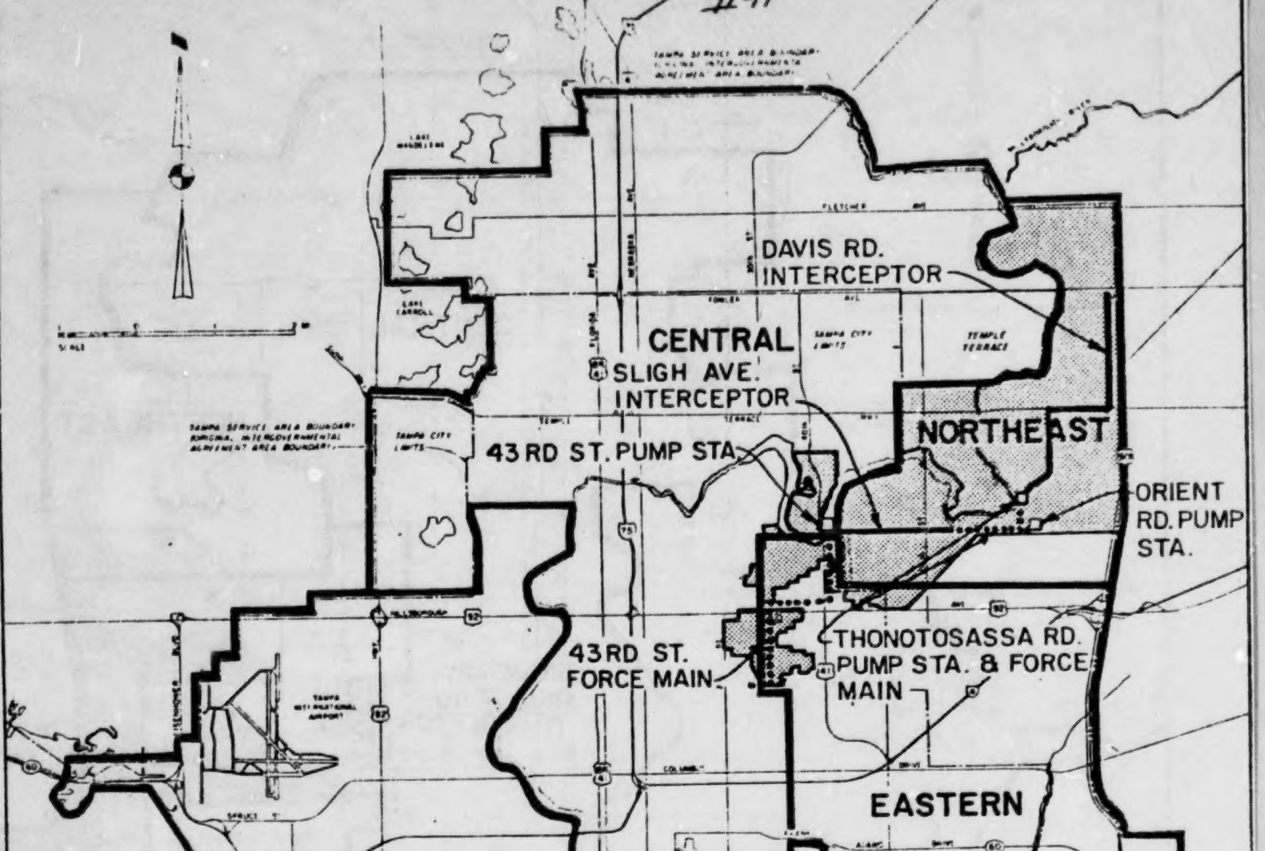
1. Proposed Collection Systems. A number of collection systems have been proposed for the Tampa Service Area in order to provide for the existing and projected population. The need and justification for these facilities is discussed in Study Memorandum Number 6 of the 201 Facilities Plan. The proposed collection systems are described in relation to the Study Area which they are designed to serve. Many of these facilities are designed to connect to existing collection systems for transmission to the Hooker's Point Treatment Plant.

a. Northeast Study Area

It is proposed that the northeast intercepting system (Figure II-1), be constructed to provide for the conveyance of most of the wastewater generated in the Northeast Study Area. The system consists of gravity sewers, force mains and three pumping stations. The shaded areas represent the neighborhood sewers and areas to be serviced by the proposed collection system.

b. Eastern Study Area

Two additional intercepting systems are proposed to service the Eastern Study Area. These are the eastern and the southeastern intercepting systems as shown on Figures II-2 and II-3 respectively.


TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
LAKE MAGDALENE
LAKE CARROLL
FLETCHER AVE
FOWLER AVE
DAVIS RD.
INTERCEPTOR
CENTRAL
TAMPA CITY LIMITS
TEMPLE TERRACE
SLIGH AVE.
INTERCEPTOR
NORTHEAST
43 RD ST. PUMP STA
ORIENT
RD. PUMP
STA.
THONOTOSASSA RD.
PUMP STA. & FORCE
MAIN
43RD ST.
FORCE MAIN
TAMPA INTERNATIONAL AIRPORT
EASTERN
INTERBAY
McKAY BAY
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

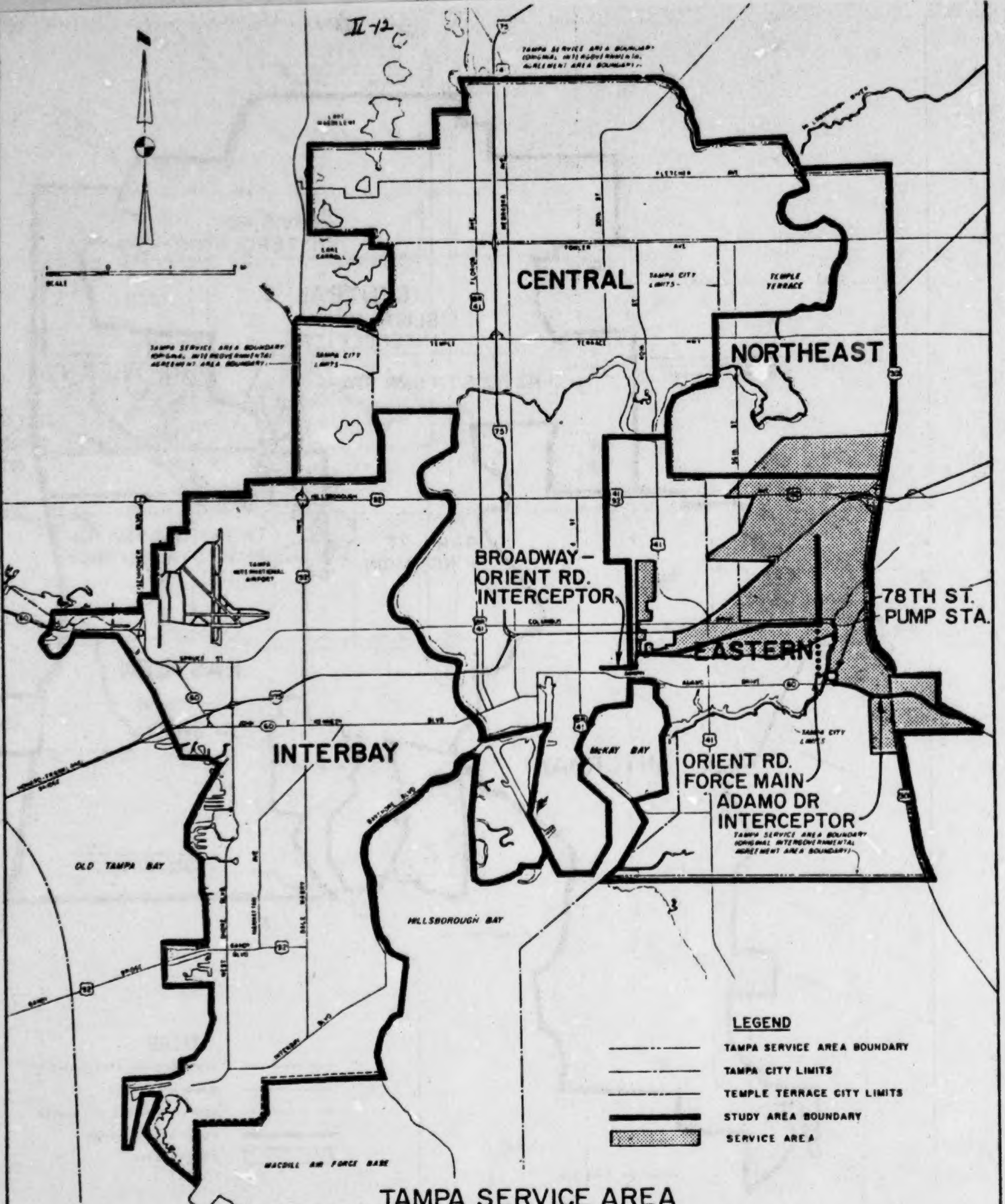
TAMPA SERVICE AREA
NORTHEAST INTERCEPTING SYSTEM
SERVICE AREA-YEAR 2020

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY-TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

DAMES & MOORE

FIGURE II-1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NORTHEAST
EASTERN
INTERBAY
BROADWAY-ORIENT RD. INTERCEPTOR
78TH ST. PUMP STA.
ORIENT RD. FORCE MAIN
ADAMO DR INTERCEPTOR
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
TAMPA CITY LIMITS
TEMPLE TERRACE
FLETCHER AVE
FOWLER AVE
TEMPLE TERRACE HWY
HILLSBOROUGH
COLUMBUS
KENNEDY BLVD
ADAMO DRIVE
TAMPA INTERNATIONAL AIRPORT
McKAY BAY
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
SCALE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

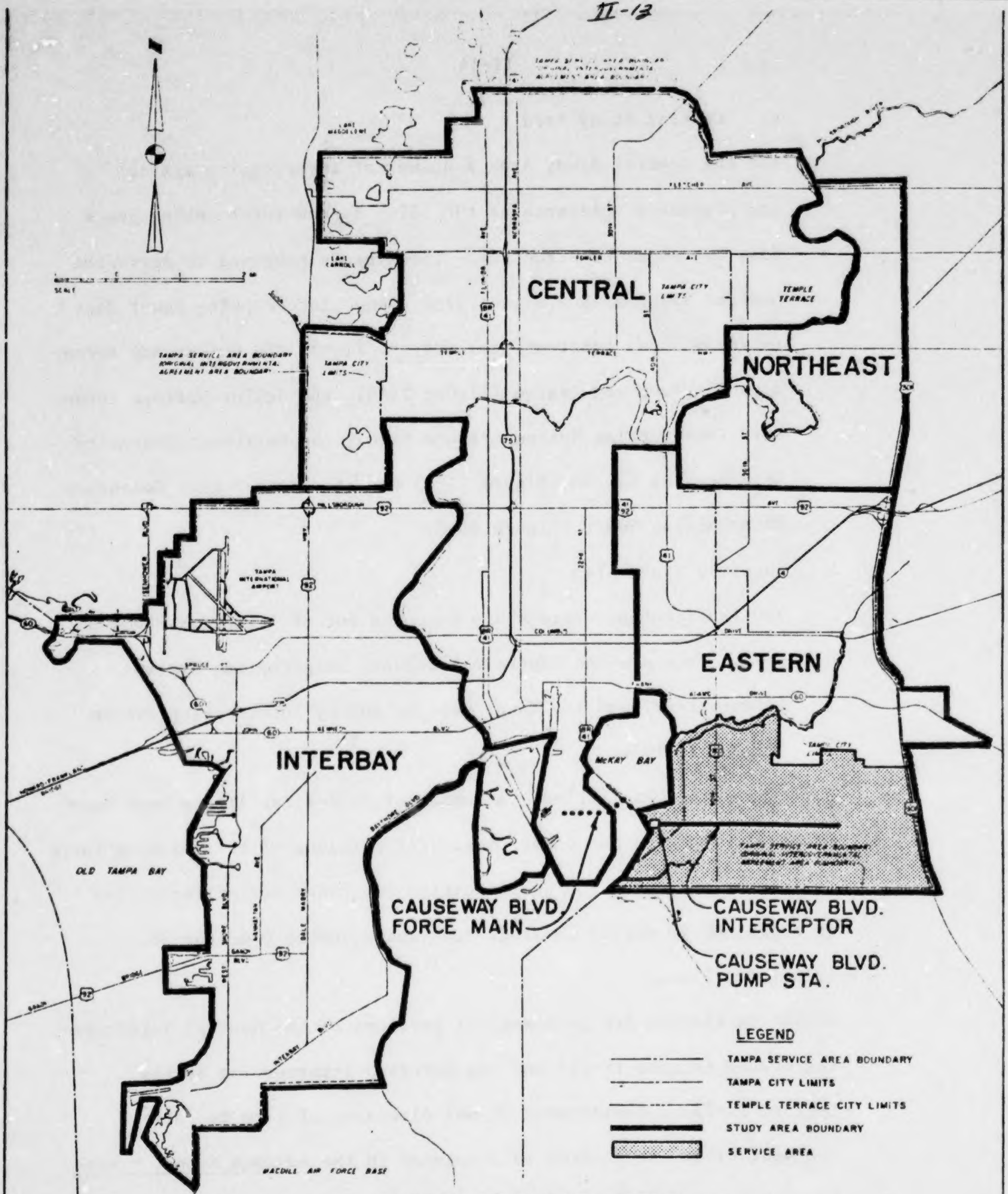
TAMPA SERVICE AREA
EASTERN INTERCEPTING SYSTEM
SERVICE AREA - YEAR 2020

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY - TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

DAMES & MOORE

FIGURE II-2


CENTRAL
NORTHEAST
EASTERN
INTERBAY
TEMPLE TERRACE
TAMPA CITY LIMITS
TAMPA INTERNATIONAL AIRPORT
McKAY BAY
OLD TAMPA BAY
MACDILL AIR FORCE BASE
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
CAUSEWAY BLVD FORCE MAIN
CAUSEWAY BLVD. INTERCEPTOR
CAUSEWAY BLVD. PUMP STA.
SCALE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
SOUTHEAST INTERCEPTING SYSTEM
SERVICE AREA-YEAR 2020

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY- TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA C120634010

DAMES & MOORE
FIGURE II-3

c. Central Study Area

For the Central Study Area a number of intercepting systems are proposed; some such as the 131st Avenue Intercepting Sewer East are under construction. The systems proposed to serve the Central Study Area are the 131st Avenue Intercepting Sewer East (already under construction) (Figure II-4), the University Secondary Intercepting System (Figure II-5), the Sulfur Springs Secondary Intercepting System (Figure II-6), the Northwest Secondary Intercepting System (Figure II-7) and the Kirby Street Secondary Intercepting Sewer (Figure II-8).

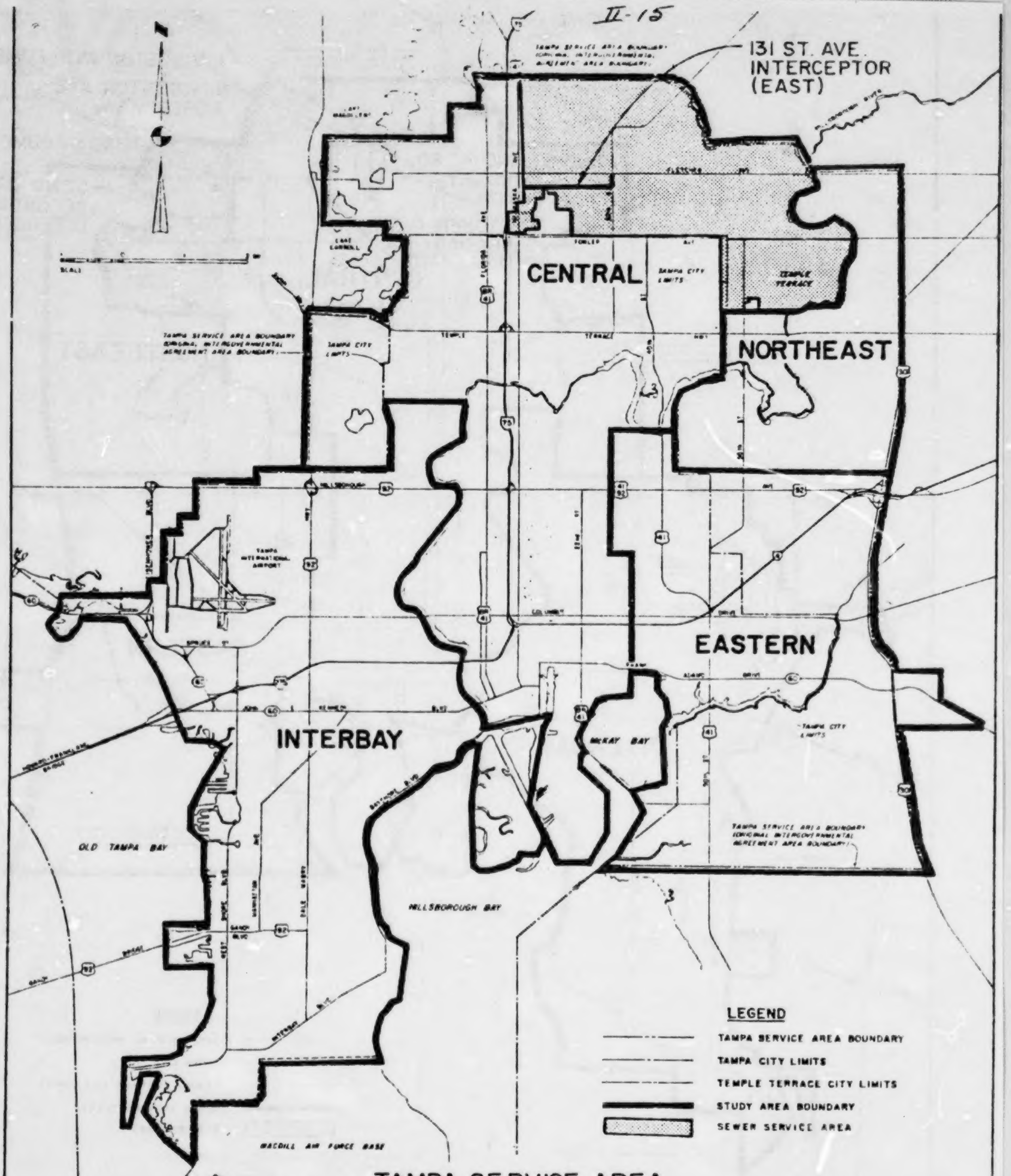
d. Interbay Study Area

Two intercepting systems are proposed for the Interbay Study Area. They are the Southern Secondary Intercepting System (Figure II-9) and the Tampa West Secondary Intercepting System (Figure II-10).

2. Proposed Relief Facilities. A number of relief facilities have been proposed for aging and often overloaded portions of the existing Tampa collection systems. The justification for these relief facilities is explained in detail in Study Memorandum Number 6 of the 201 Facilities Plan.

Relief facilities are proposed for portions of the Central Intercepting System (Figure II-11) and the Interbay Intercepting System (Figure II-12). Replacement of and diversion of flow to relieve the West River Interceptor is discussed in the Advance Report - West River Intercepting Sewer.

3. Treatment Alternatives. The existing City of Tampa Hookers Point Advanced Wastewater Treatment facility currently has capacity to


131 ST. AVE.
INTERCEPTOR
(EAST)
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
FLETCHER
FOWLER
CENTRAL
TAMPA CITY LIMITS
TEMPLE TERRACE
NORTHEAST
TEMPLE TERRACE HWY
LAKE CARROLL
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TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
OLD TAMPA BAY
HILLSBOROUGH BAY
BAYSHORE BLVD
DALE MABRY
GANDY BLVD
MACDILL AIR FORCE BASE
SCALE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SEWER SERVICE AREA

TAMPA SERVICE AREA
131ST AVE. INTERCEPTING SEWER EAST (DIV. 4A3)
SERVICE AREA - YEAR 2020

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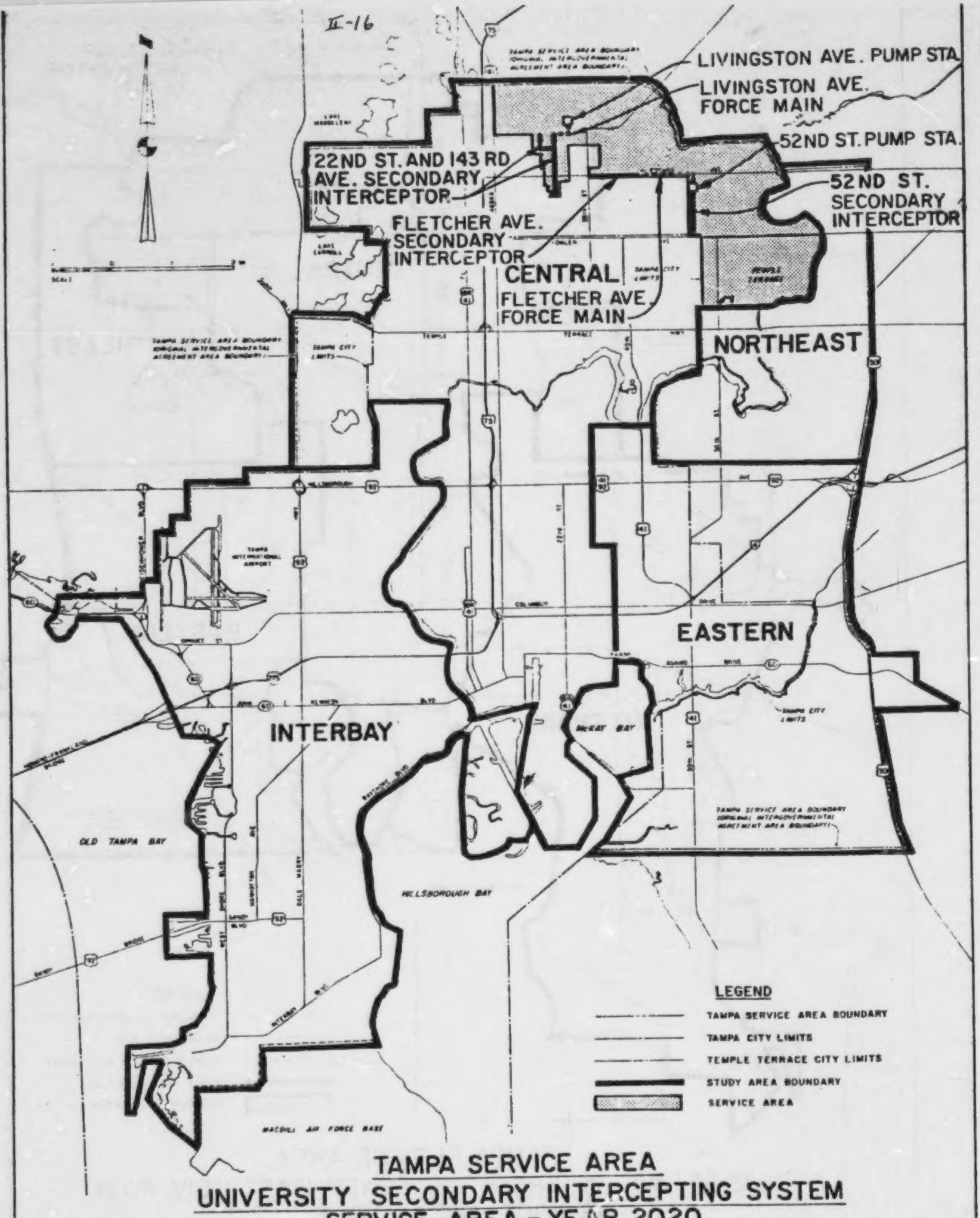
FIGURE II-4


LIVINGSTON AVE. PUMP STA.
LIVINGSTON AVE. FORCE MAIN
52ND ST. PUMP STA.
52ND ST. SECONDARY INTERCEPTOR
22ND ST. AND 143 RD AVE. SECONDARY INTERCEPTOR
FLETCHER AVE. SECONDARY INTERCEPTOR
CENTRAL
FLETCHER AVE. FORCE MAIN
NORTHEAST
EASTERN
INTERBAY
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
TAMPA CITY LIMITS
TEMPLE TERRACE
TAMPA INTERNATIONAL AIRPORT
OLD TAMPA BAY
HILLSBOROUGH BAY
McKAY BAY
MACDILL AIR FORCE BASE
SCALE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

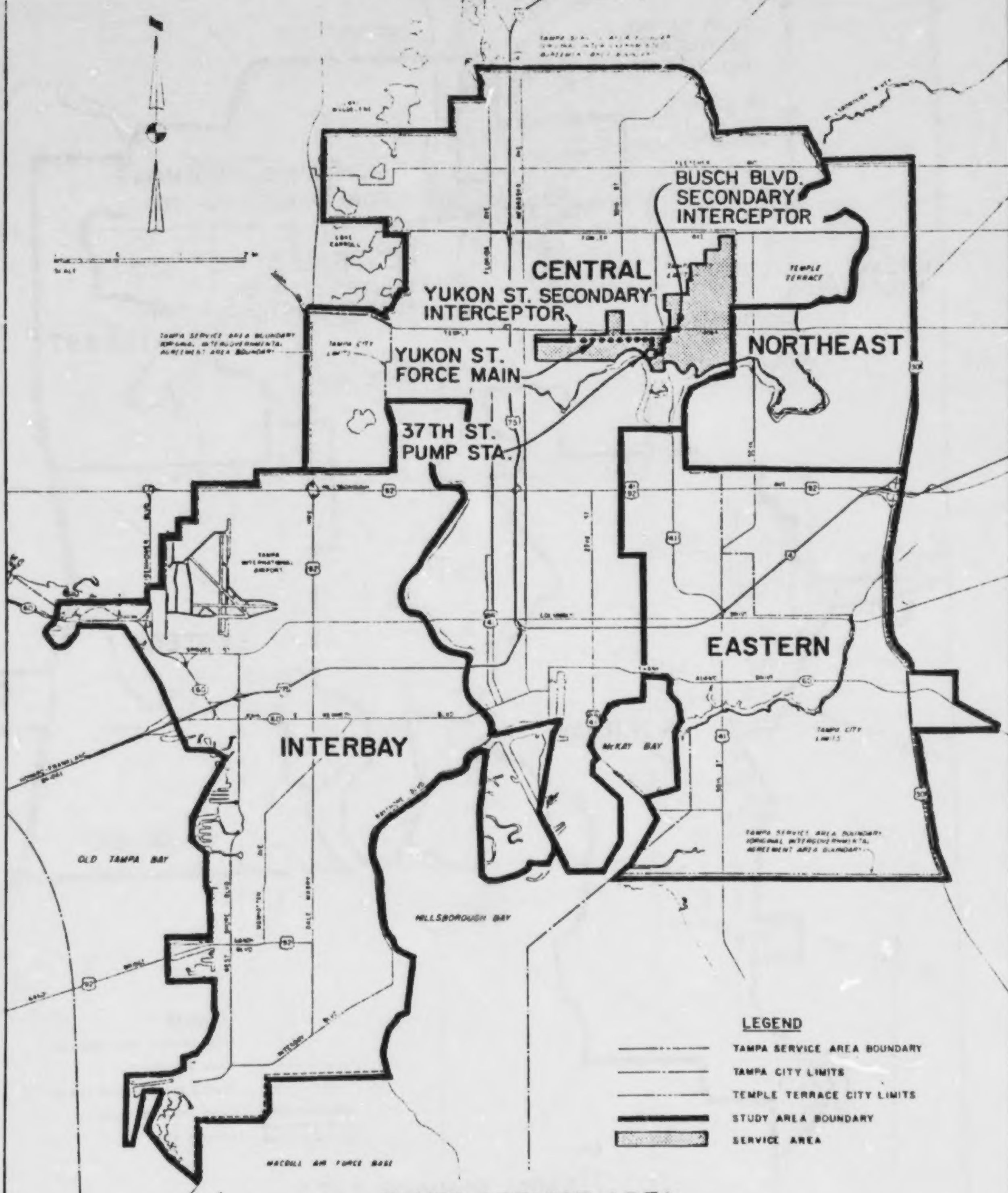
TAMPA SERVICE AREA
UNIVERSITY SECONDARY INTERCEPTING SYSTEM
SERVICE AREA - YEAR 2020

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY - TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

DAMES & MOORE

FIGURE II-5


BUSCH BLVD.
SECONDARY
INTERCEPTOR
CENTRAL
YUKON ST. SECONDARY
INTERCEPTOR
YUKON ST.
FORCE MAIN
37TH ST.
PUMP STA.
NORTHEAST
TEMPLE TERRACE
EASTERN
INTERBAY
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
TAMPA CITY LIMITS
TAMPA INTERNATIONAL AIRPORT
McKAY BAY
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
SCALE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
SULPHUR SPRINGS SECONDARY INTERCEPTING SYSTEM
SERVICE AREA – YEAR 2020

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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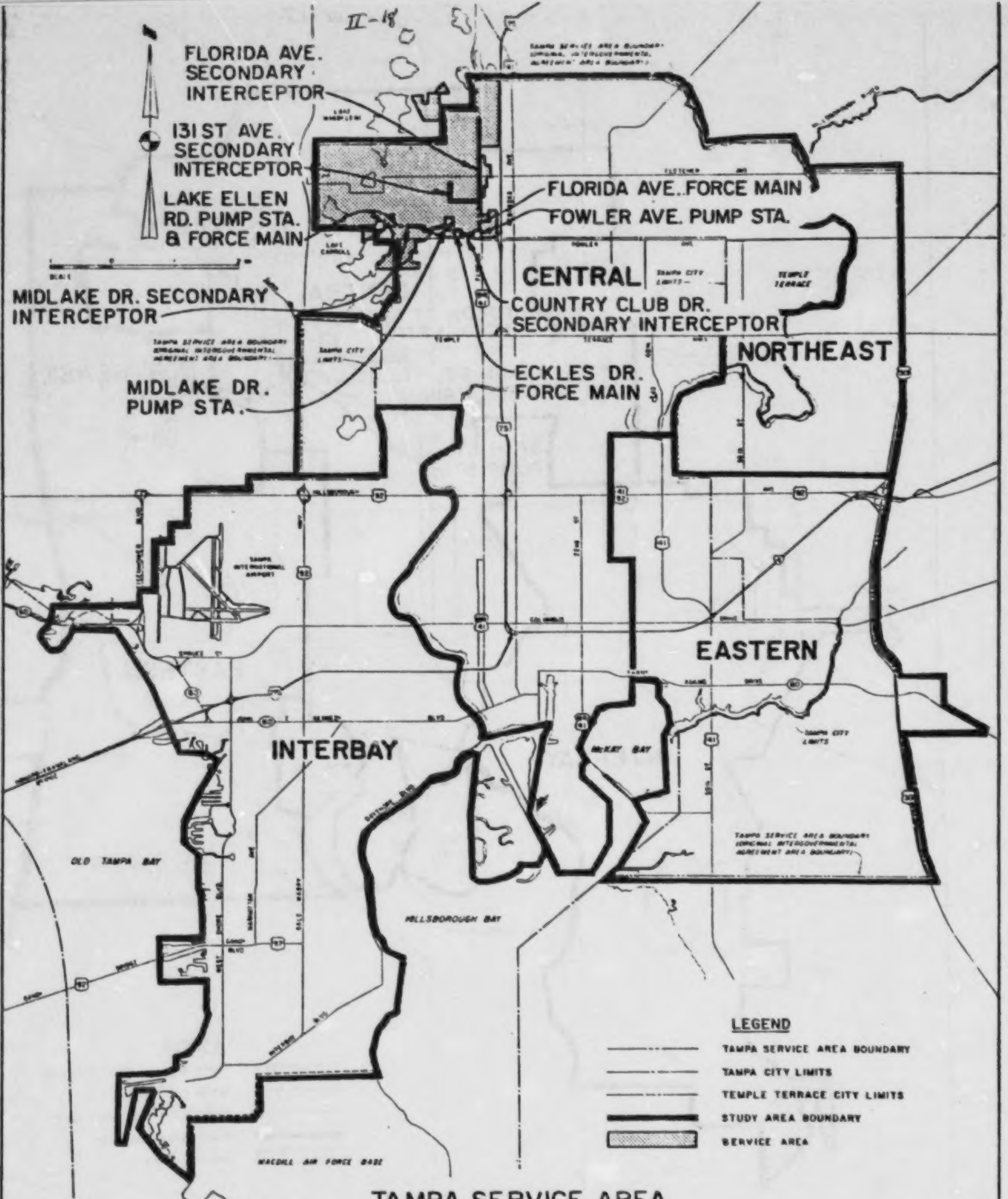
DAMES & MOORE

FIGURE II-6


FLORIDA AVE.
SECONDARY
INTERCEPTOR
131 ST AVE.
SECONDARY
INTERCEPTOR
LAKE ELLEN
RD. PUMP STA.
& FORCE MAIN
FLORIDA AVE. FORCE MAIN
FOWLER AVE. PUMP STA.
MIDLAKE DR. SECONDARY
INTERCEPTOR
CENTRAL
COUNTRY CLUB DR.
SECONDARY INTERCEPTOR
NORTHEAST
ECKLES DR.
FORCE MAIN
MIDLAKE DR.
PUMP STA.
TAMPA INTERNATIONAL AIRPORT
EASTERN
INTERBAY
McKAY BAY
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
TAMPA CITY LIMITS
TEMPLE TERRACE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
NORTHWEST SECONDARY INTERCEPTING SYSTEM
SERVICE AREA-YEAR 2020

SOURCE:

SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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EPA No. C120634010

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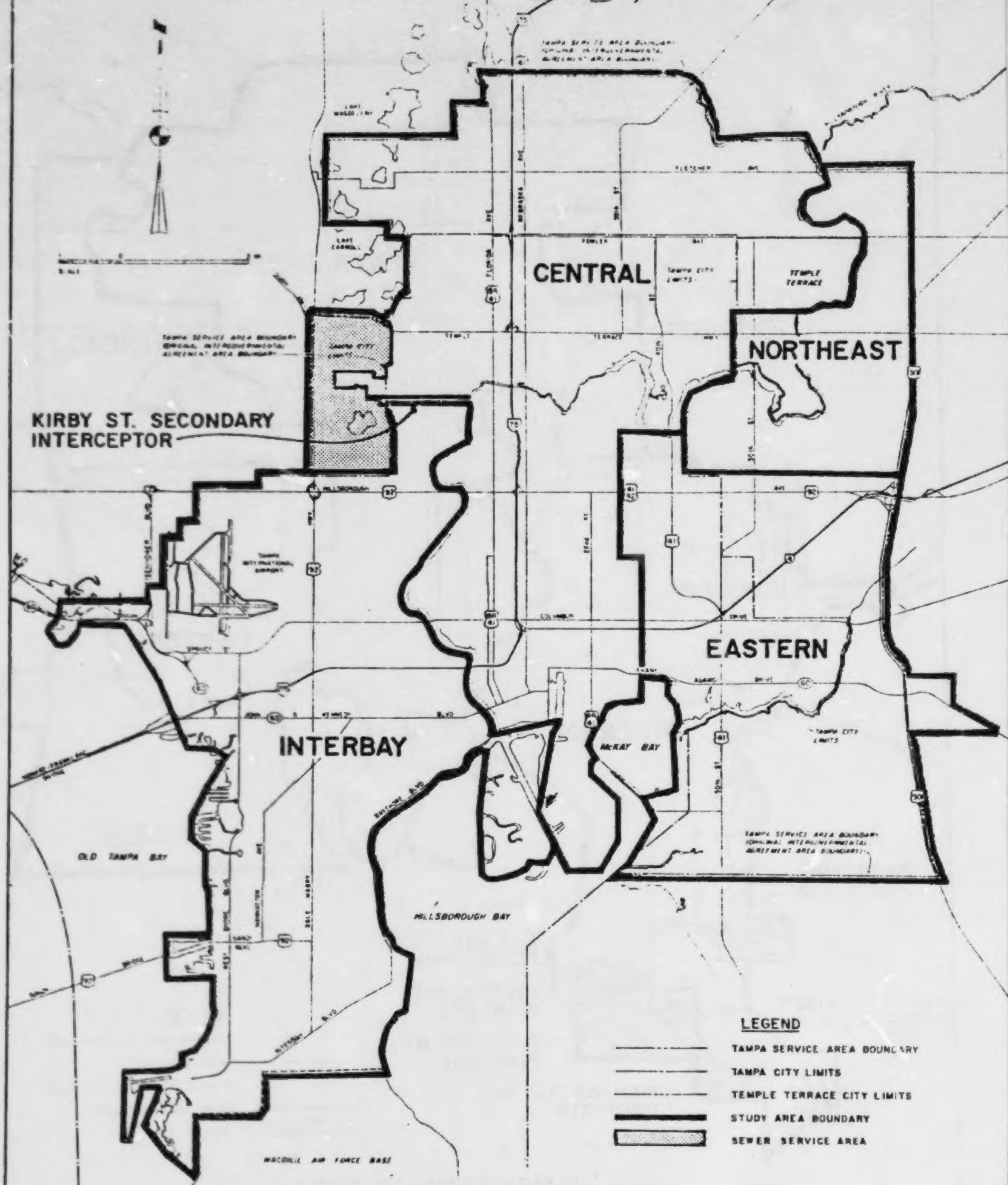
FIGURE II-7


CENTRAL
NORTHEAST
EASTERN
INTERBAY
KIRBY ST. SECONDARY INTERCEPTOR
TEMPLE TERRACE
TAMPA CITY LIMITS
FLETCHER AVE
FOWLER AVE
HILLSBOROUGH
COLUMBUS
McKAY BAY
HILLSBOROUGH BAY
OLD TAMPA BAY
MACDILL AIR FORCE BASE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SEWER SERVICE AREA

TAMPA SERVICE AREA
KIRBY ST. SECONDARY INTERCEPTING SEWER (DIV. 4C13)
SERVICE AREA - YEAR 2020

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GREELEY AND HANSEN
ENGINEERS

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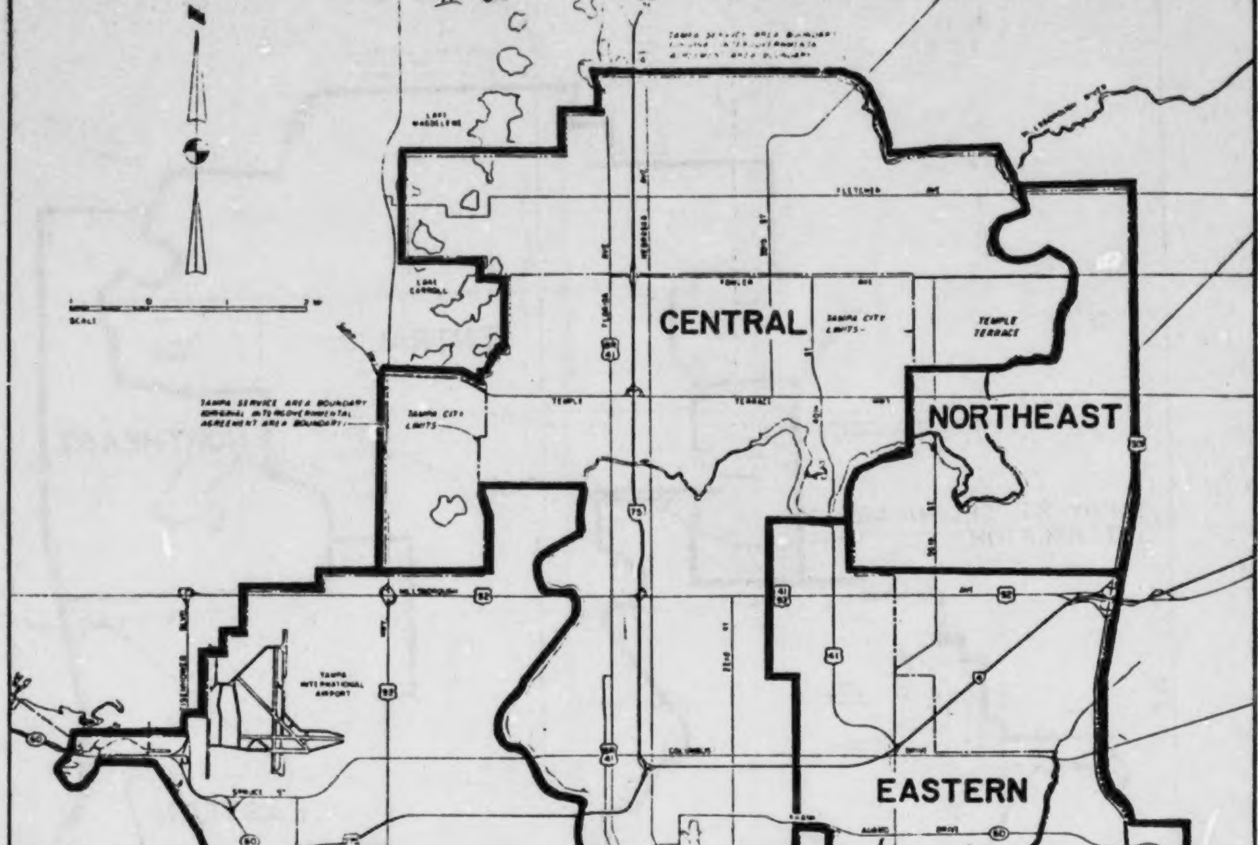
FIGURE II-8


CENTRAL
NORTHEAST
EASTERN
INTERBAY
McKAY BAY
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
TAMPA INTERNATIONAL AIRPORT
TEMPLE TERRACE
TAMPA CITY LIMITS
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
FLETCHER AVE
FOWLER AVE
TEMPLE TERRACE HWY
HILLSBOROUGH AVE
COLUMBUS DRIVE
ADAMO DRIVE
KENNEDY BLVD
PRICE AVE. FORCE MAIN
BAY AVE. FORCE MAIN
AVERILL AVE. PUMP STA.
MANHATTAN AVE. FORCE MAIN
SHERIDAN RD. PUMP STA.
MANHATTAN AVE. PUMP STA.
SCALE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
SOUTHERN SECONDARY INTERCEPTING SYSTEM
SERVICE AREA–YEAR 2020

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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EPA No. C120634010

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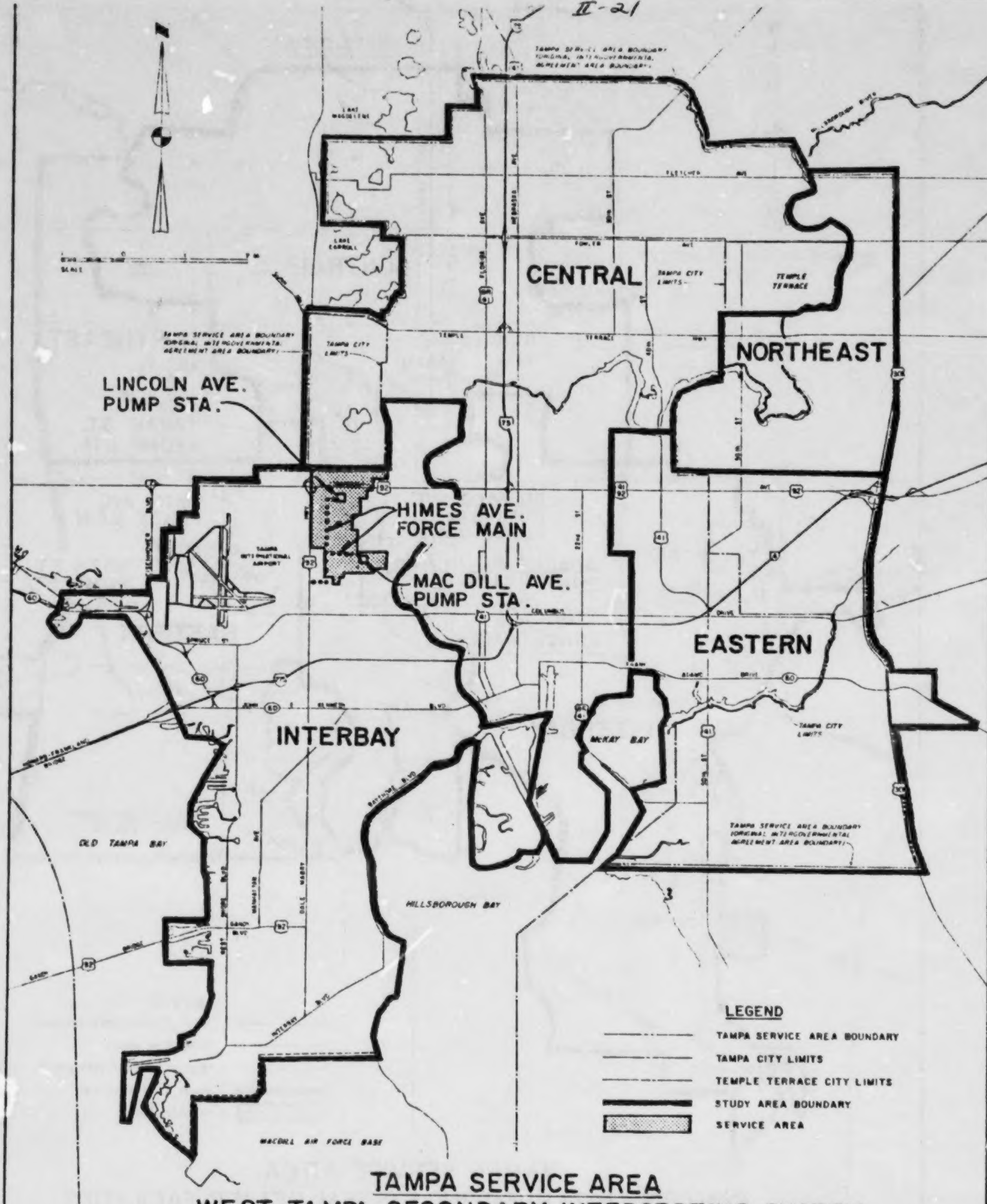
FIGURE II-9


TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
LAKE MAGDALENE
LAKE CARROLL
FLETCHER AVE
FOWLER AVE
CENTRAL
TAMPA CITY LIMITS
TEMPLE TERRACE
NORTHEAST
TEMPLE TERRACE
LINCOLN AVE. PUMP STA.
HIMES AVE. FORCE MAIN
MAC DILL AVE. PUMP STA.
TAMPA INTERNATIONAL AIRPORT
COLUMBUS
EASTERN
INTERBAY
McKAY BAY
TAMPA CITY LIMITS
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
WEST TAMPA SECONDARY INTERCEPTING SYSTEM
SERVICE AREA – YEAR 2020

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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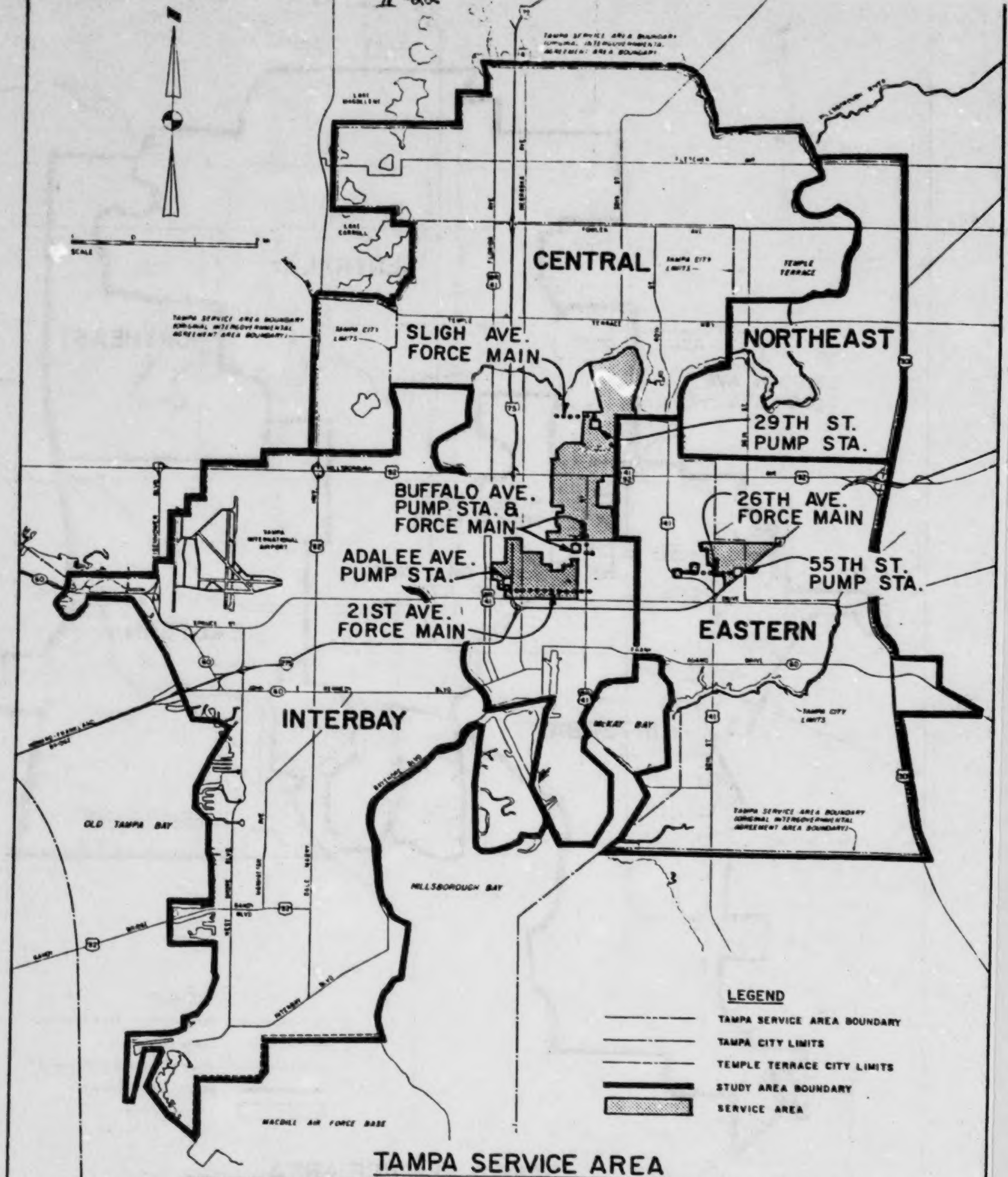
FIGURE II - 10


TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
SCALE
CENTRAL
TAMPA CITY LIMITS
TEMPLE TERRACE
NORTHEAST
SLIGH AVE. FORCE MAIN
29TH ST. PUMP STA.
BUFFALO AVE. PUMP STA. & FORCE MAIN
26TH AVE. FORCE MAIN
ADALEE AVE. PUMP STA.
55TH ST. PUMP STA.
21ST AVE. FORCE MAIN
TAMPA INTERNATIONAL AIRPORT
EASTERN
INTERBAY
McKAY BAY
OLD TAMPA BAY
HILLSBOROUGH BAY
MACDILL AIR FORCE BASE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
CENTRAL INTERCEPTING SYSTEM RELIEF FACILITIES
SERVICE AREA – YEAR 2020

SOURCE :

SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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201 FACILITY PLAN
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EPA No. C120634 010

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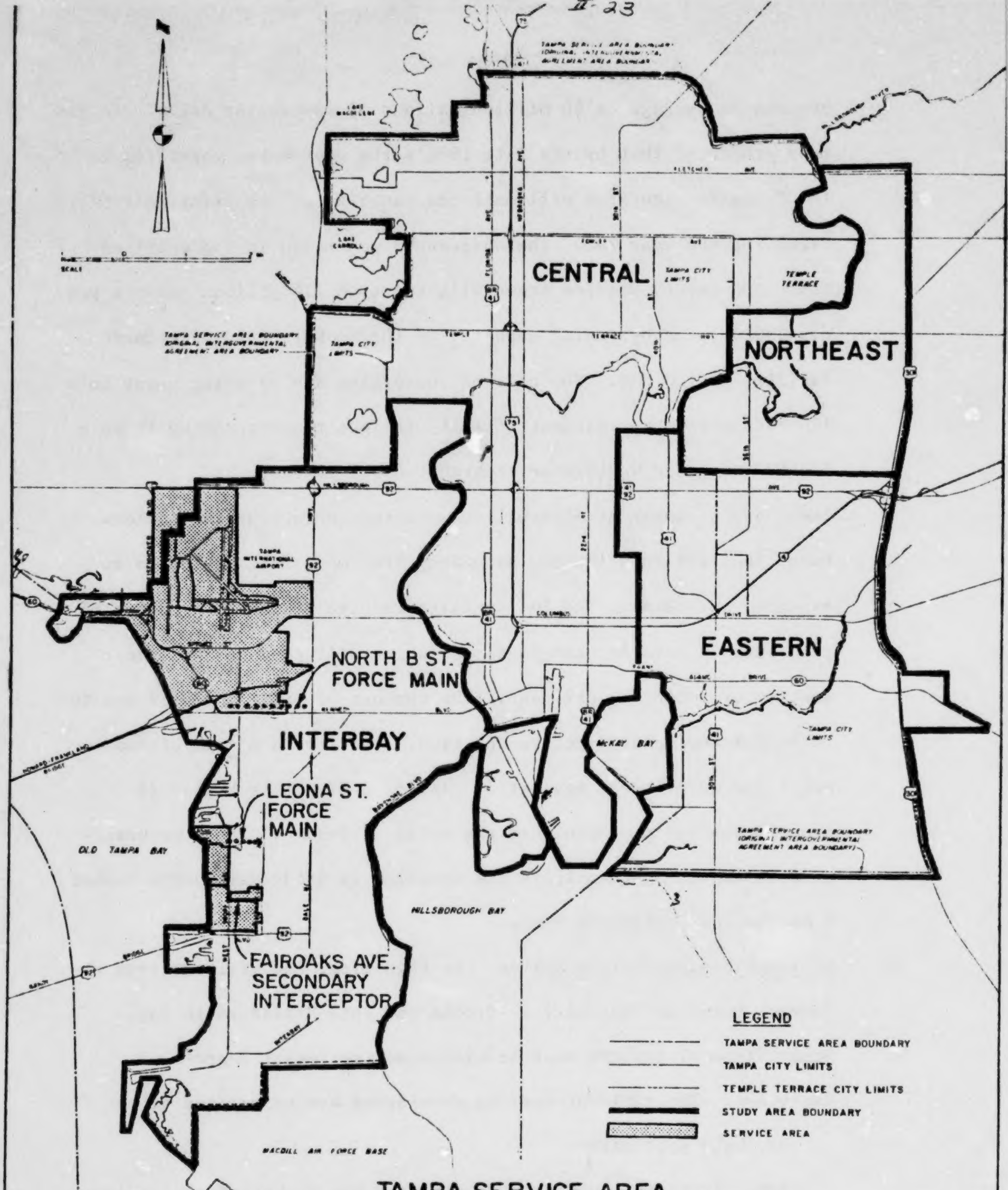
FIGURE II-11


SCALE
TAMPA SERVICE AREA BOUNDARY (ORIGINAL INTERGOVERNMENTAL AGREEMENT AREA BOUNDARY)
LAKE MAGDALENE
LAKE CARROLL
FLETCHER
FOWLER
CENTRAL
TAMPA CITY LIMITS
TEMPLE TERRACE
NORTHEAST
TEMPLE
HILLSBOROUGH
TAMPA INTERNATIONAL AIRPORT
COLUMBUS
EASTERN
NORTH B ST.
FORCE MAIN
KENNEDY BLVD
INTERBAY
McKAY BAY
LEONA ST.
FORCE MAIN
OLD TAMPA BAY
HILLSBOROUGH BAY
FAIROAKS AVE.
SECONDARY
INTERCEPTOR
MACDILL AIR FORCE BASE
LEGEND
TAMPA SERVICE AREA BOUNDARY
TAMPA CITY LIMITS
TEMPLE TERRACE CITY LIMITS
STUDY AREA BOUNDARY
SERVICE AREA

TAMPA SERVICE AREA
INTERBAY INTERCEPTING SYSTEM RELIEF FACILITIES
SERVICE AREA-YEAR 2020

SOURCE:
SMITH, AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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ENVIRONMENTAL REPORT
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FIGURE II-12

process an average of 60 million gallons of wastewater daily. It has been projected that by the late 1980's the wastewater generated in the Tampa Service Area will meet the capacity of the existing facilities. By the year 2000, the wastewater generated in the combined Tampa and County Service Areas will approach 114 million gallons per day (MGD). The hydraulic capacity of the Hookers Point Treatment facility is 120 MGD. The cost of converting the existing plant to a 120 MGD secondary treatment facility is less than expanding it to a 120 MGD Advanced Wastewater Treatment (AWT) facility.

There are a number of alternative ways for converting the Hookers Point facility to a 120 MGD secondary treatment facility or to an expanded AWT plant. The 201 Consultants have evaluated a number of processes in parallel and in series which will produce the same quality of secondary effluent. The purpose of their analysis was to determine the cost-effective solution. Two levels of AWT effluent, AWT-I and AWT-II were evaluated. AWT-II effluent is higher in phosphorous and nitrogen than the original design. These processes as well as the cost analysis are detailed in Study Memorandum Number 8 of the 201 Facilities Plan.

4. Effluent Disposal Alternatives. At this time, the effluent from the Hookers Point AWT facility is discharged into Hillsborough Bay. Other disposal options must be evaluated for lesser degrees of treatment. The effluent options considered are summarized below:

a. Land Application

Spray irrigation of the effluent from the Hookers Point treatment facility would require a large area of land. With the soil conditions in the area, approximately 32 square miles of the square miles of the southeastern portion of the County Service Area would be required. In addition, a dual (66") pipeline with approximately four pumping stations would be located along local roads. It is estimated that eight holding ponds or distribution points which have six or seven associated spray fields each would be required to dispose of the effluent. Figure II-13 illustrates the concept and indicates the approximate routes and location of the proposed facilities.

b. Surface Water Discharge

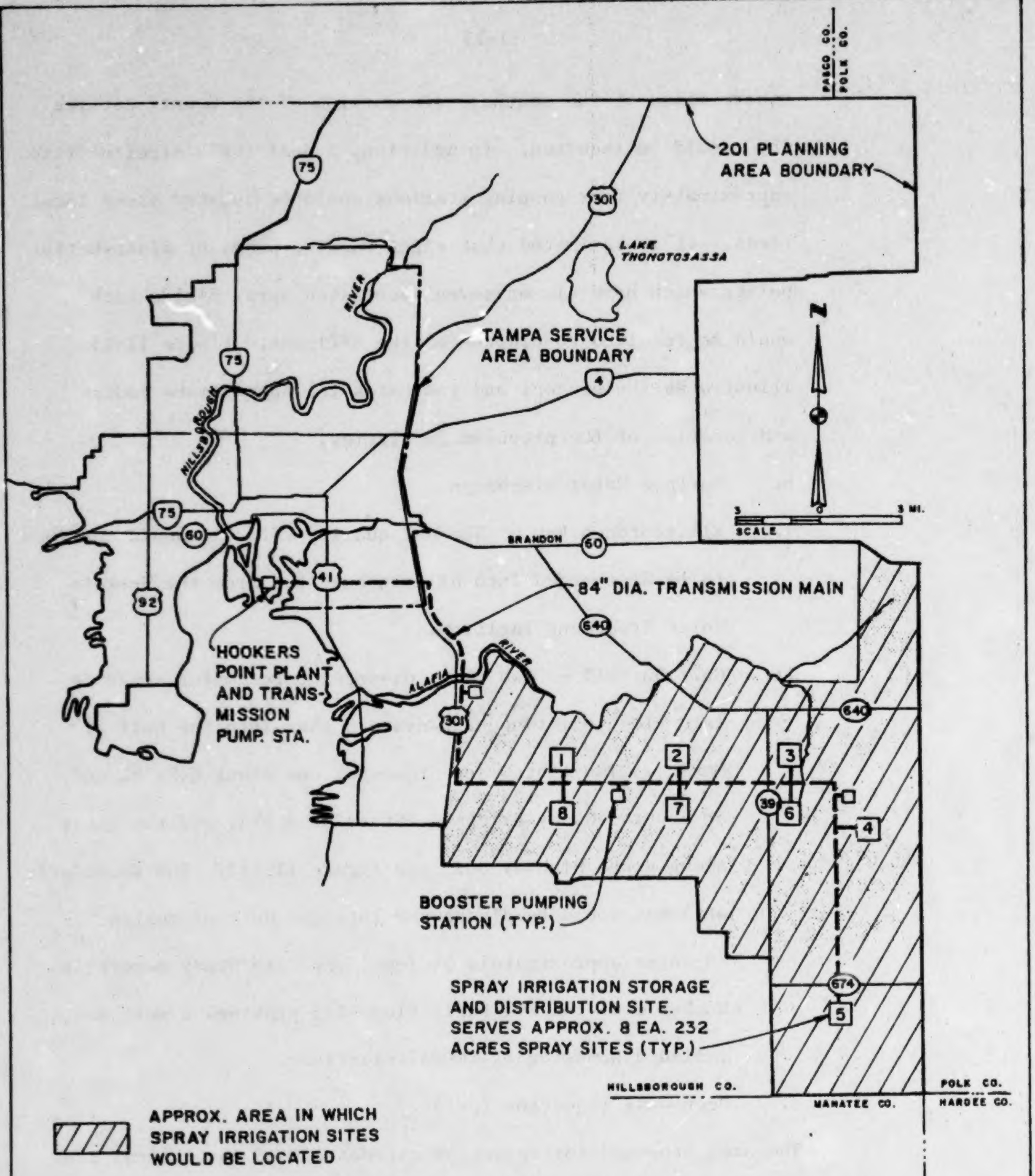
i. Hillsborough Bay - The AWT quality effluent would continue to be discharged into Hillsborough Bay from the Hookers Point Treatment facility.

ii. Gulf Outfall - Two large diameter force mains would be laid along existing highways and then into the Gulf of Mexico. Two routes are proposed, one along U.S. 92 and across the Gandy Bridge to State Road 694, and the other along State Highway 601 (see Figure II-14). The secondary effluent would be discharged into the Gulf of Mexico in water approximately 36 feet deep. to Study Memorandum Number 8 of the 201 Facilities Plan provides a more detailed discussion of the alternatives.

c. Deep Well Injection (DWI)

The area proposed for injection extends around the coastal zone of Tampa and Hillsborough Bays. Approximately 143 injection wells, 20 miles of 66-inch, and 40 miles of 36-inch average diameter force main would be required. In addition, approximately nine pumping stations would be required as well as an

II-26


PASCO CO.
POLK CO.
201 PLANNING AREA BOUNDARY
75
301
LAKE THONOTOSASSA
RIVER
HILLSBOROUGH
TAMPA SERVICE AREA BOUNDARY
75
4
N
3 0 3 MI.
SCALE
75
60
BRANDON
60
84" DIA. TRANSMISSION MAIN
41
92
640
HOOKERS POINT PLANT AND TRANS-MISSION PUMP. STA.
ALAFIA RIVER
301
640
1
2
3
8
7
39
6
4
BOOSTER PUMPING STATION (TYP.)
SPRAY IRRIGATION STORAGE AND DISTRIBUTION SITE. SERVES APPROX. 8 EA. 232 ACRES SPRAY SITES (TYP.)
674
5
HILLSBOROUGH CO.
MANATEE CO.
POLK CO.
HARDEE CO.
APPROX. AREA IN WHICH SPRAY IRRIGATION SITES WOULD BE LOCATED

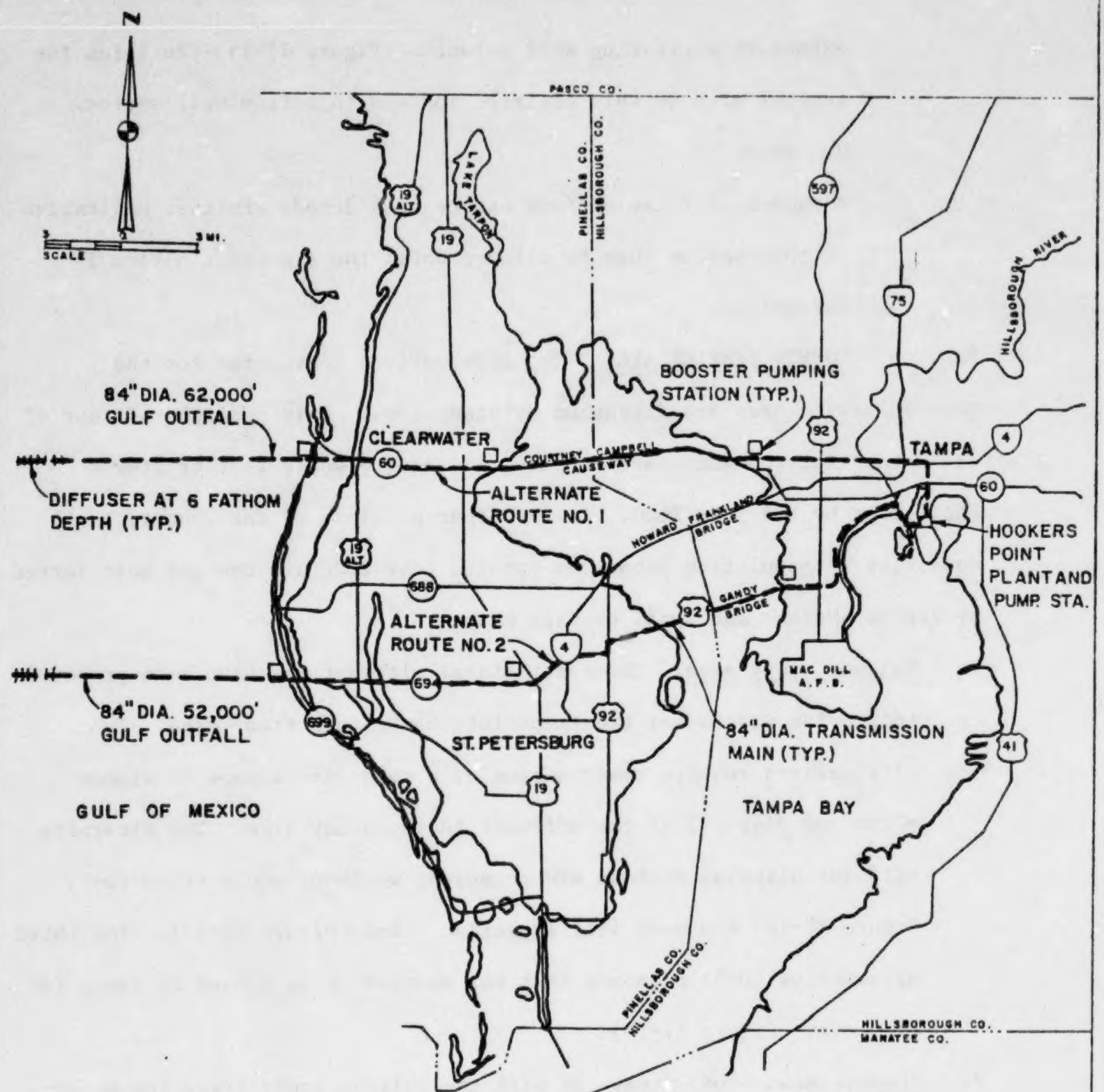
PRELIMINARY LOCATION PLAN ALTERNATE S-1, SPRAY IRRIGATION SECONDARY TREATMENT

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY – TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

DAMES & MOORE

FIGURE II-13


N
3
0
3 MI.
SCALE
PASCO CO.
PINELLAS CO.
HILLSBOROUGH CO.
LAKE TARPON
19 ALT
19
597
75
HILLSBOROUGH RIVER
BOOSTER PUMPING
STATION (TYP.)
84" DIA. 62,000'
GULF OUTFALL
CLEARWATER
92
4
TAMPA
60
COURTNEY CAMPBELL CAUSEWAY
ALTERNATE
ROUTE NO. 1
60
DIFFUSER AT 6 FATHOM
DEPTH (TYP.)
HOWARD FRANKLAND BRIDGE
HOOKERS
POINT
PLANT AND
PUMP. STA.
19 ALT
688
92
GANDY BRIDGE
ALTERNATE
ROUTE NO. 2
4
MAC DILL
A.F.B.
694
84" DIA. 52,000'
GULF OUTFALL
699
92
84" DIA. TRANSMISSION
MAIN (TYP.)
41
ST. PETERSBURG
19
GULF OF MEXICO
TAMPA BAY
PINELLAS CO.
HILLSBOROUGH CO.
HILLSBOROUGH CO.
MANATEE CO.

PRELIMINARY LOCATION PLAN
ALTERNATE S-2, GULF OUTFALL
SECONDARY TREATMENT

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY – TAMPA
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ENVIRONMENTAL REPORT
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FIGURE II-14

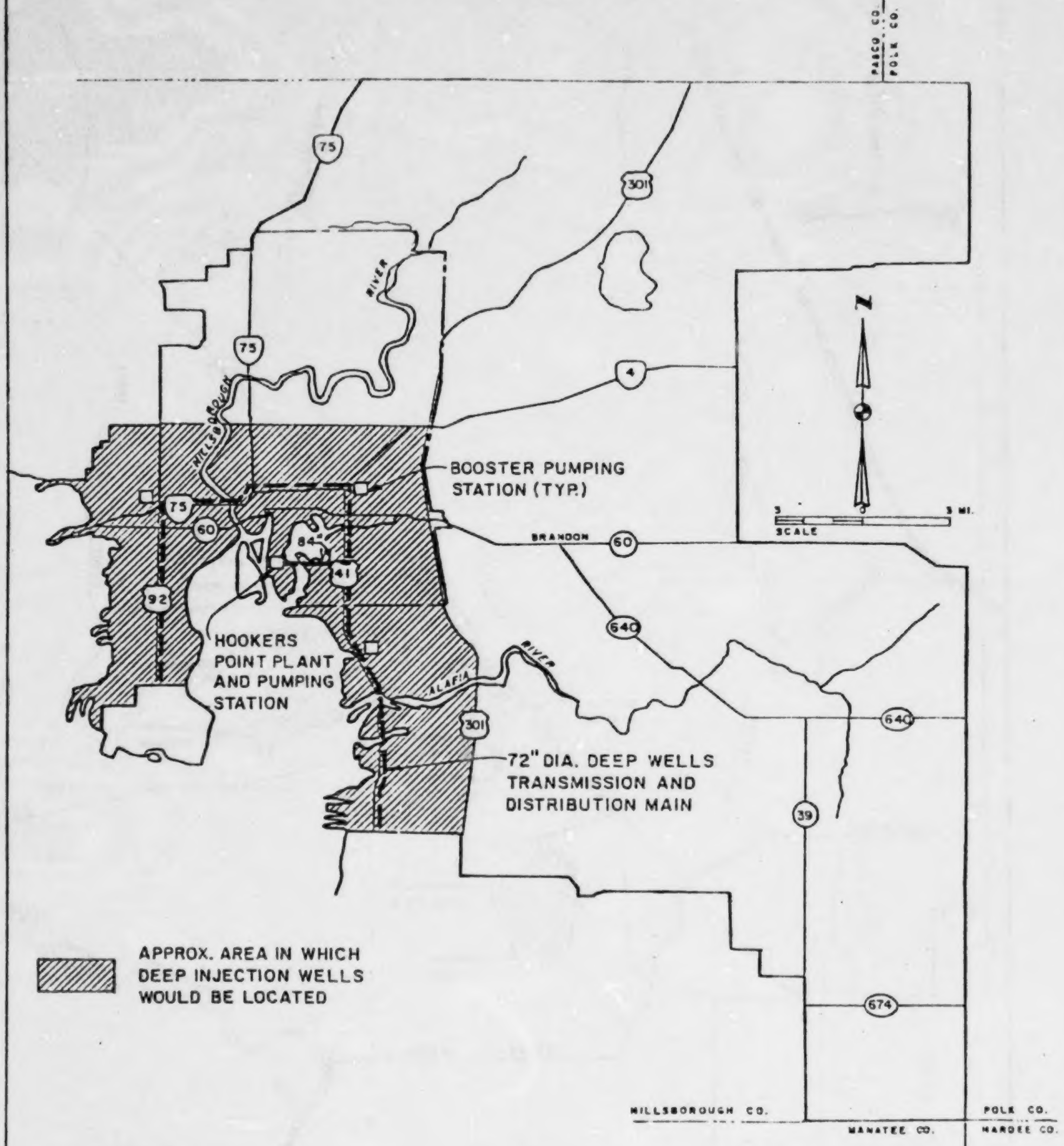
extensive monitoring well network. Figure II-15 identifies the general area of this distribution and injection well system.

d. Reuse

A number of reuse options can be considered. Further evaluation of this option must be delayed until the treatment option is determined.

B. COUNTY SERVICE AREA: The alternatives considered for the County Service Area are discussed by Study Area. Only portions of four of the County Service Areas are expected to require wastewater treatment facilities by the year 2000. In the other portions of the county, the densities of population projected for the year 2000 are thought best served by septic systems and small package plants.

1. Deltona Study Area. Three structural alternatives have been proposed to provide wastewater treatment for the Deltona Study Area. Two alternatives require construction of a secondary sewage treatment plant and disposal of the effluent in the study area. Two alternate effluent disposal methods are proposed, wetlands application (D-1, Figure II-16) and deep well injection (D-2, Figure II-17). The third alternative (D-3) proposes that the wastewater be pumped to Tampa for treatment (Figure II-18).
2. Thonotosassa Study Area. As with the Deltona Study Area, the alternatives deal with pumping the wastewater effluent to Tampa for treatment or treating and disposing of the effluent locally. Alternative T-1 (Figure II-19) is to construct a secondary sewage treatment plant and dispose of the effluent at a spray irrigation site. Alternative T-2 is to dispose of filtered secondary-treated effluent via deep well


PASCO CO.
POLK CO.
75
301
RIVER
HILLSBOROUGH
75
4
N
3
3 MI.
SCALE
BOOSTER PUMPING
STATION (TYP.)
75
60
84
41
92
BRANDON
60
640
RIVER
ALAFIA
HOOKERS
POINT PLANT
AND PUMPING
STATION
301
640
72" DIA. DEEP WELLS
TRANSMISSION AND
DISTRIBUTION MAIN
39
▨ APPROX. AREA IN WHICH
DEEP INJECTION WELLS
WOULD BE LOCATED
674
HILLSBOROUGH CO.
POLK CO.
MANATEE CO.
HARDEE CO.

PRELIMINARY LOCATION PLAN
ALTERNATE S-3, DEEP WELL INJECTION
SECONDARY TREATMENT (FILTERED EFFLUENT)

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY - TAMPA
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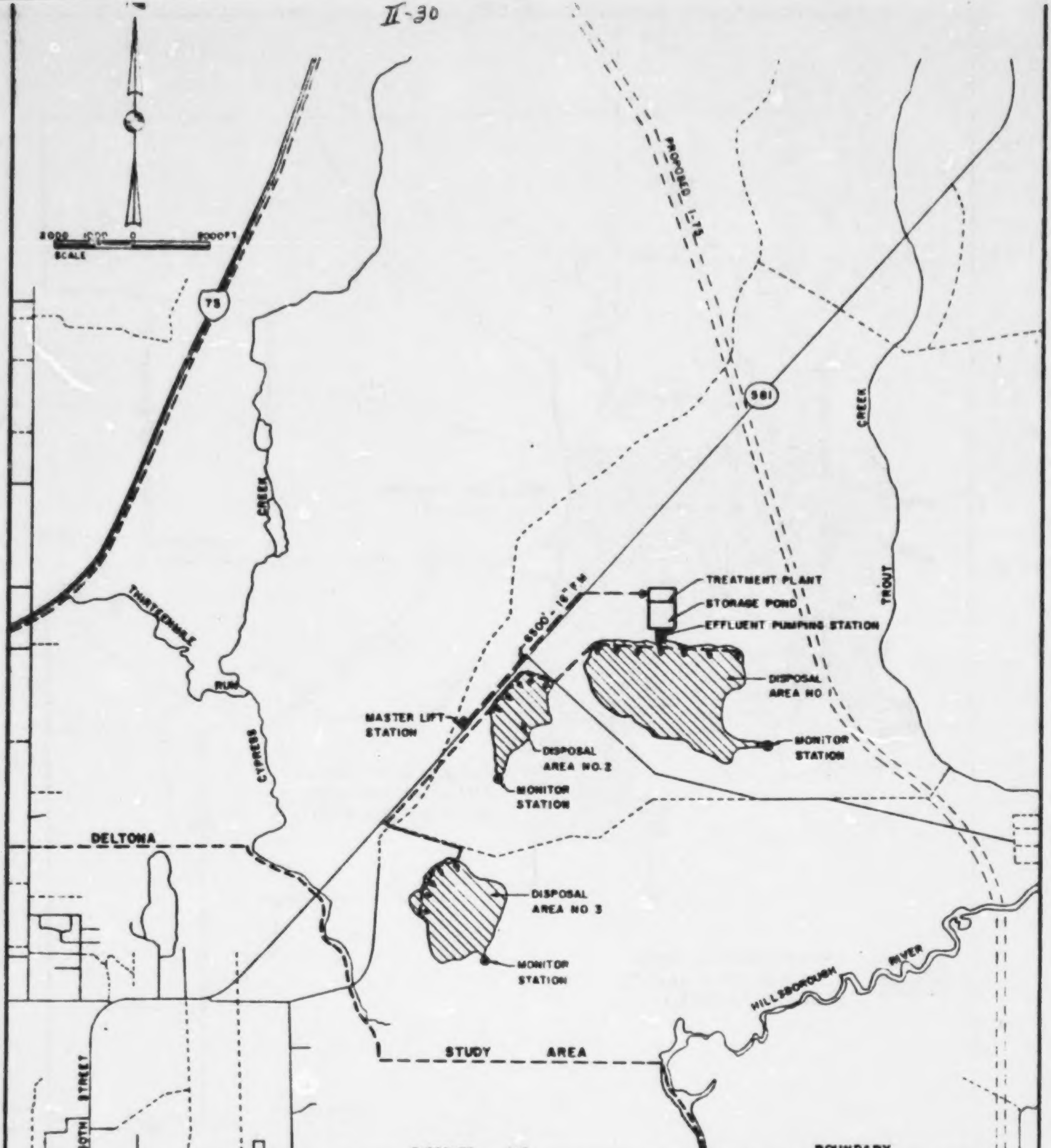
EPA C120634010

DAMES & MOORE

FIGURE II-15


2000 1000 0 2000FT
SCALE
75
PROPOSED I-75
581
CREEK
TROUT
THIRTEENMILE
RUN
CREEK
CYPRESS
6500' - 16" FM
TREATMENT PLANT
STORAGE POND
EFFLUENT PUMPING STATION
DISPOSAL AREA NO 1
MONITOR STATION
MASTER LIFT STATION
DISPOSAL AREA NO.2
MONITOR STATION
DELTONA
DISPOSAL AREA NO 3
MONITOR STATION
HILLSBOROUGH RIVER
STUDY AREA
30TH STREET
FLETCHER AVE.
BOUNDARY

COUNTY ALTERNATIVE D1

SECONDARY TREATMENT/WETLANDS DISPOSAL

SOURCE :

SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY - TAMPA
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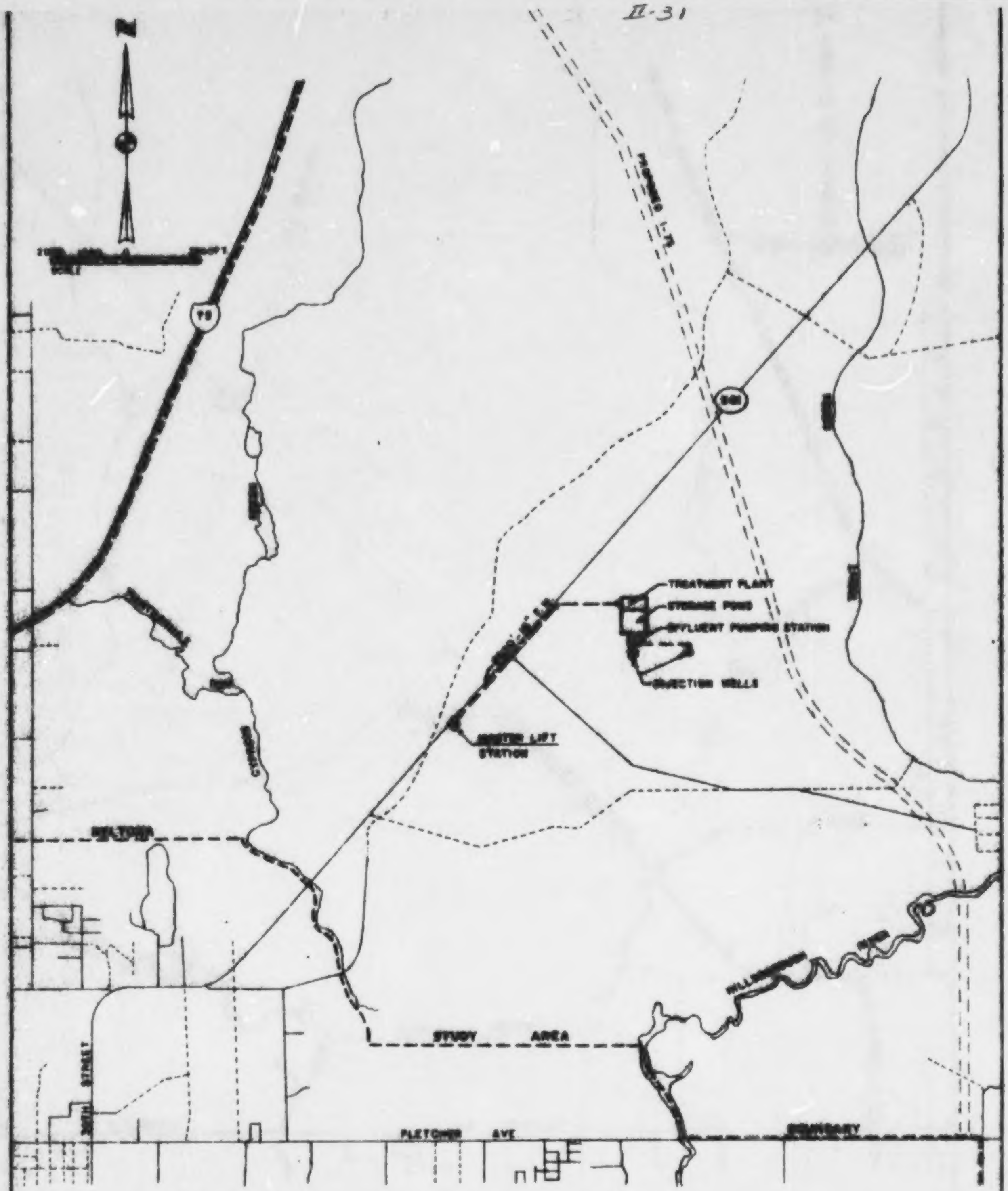
FIGURE II-16


N
75
301
PROPOSED I-75
TREATMENT PLANT
STORAGE POND
EFFLUENT PUMPING STATION
INJECTION WELLS
BOOSTER LIFT STATION
STUDY AREA
30TH STREET
FLETCHER AVE
BOUNDARY
HILLSBOROUGH RIVER

COUNTY ALTERNATIVE D2
SECONDARY TREATMENT/ FILTRATION
DEEP WELL INJECTION

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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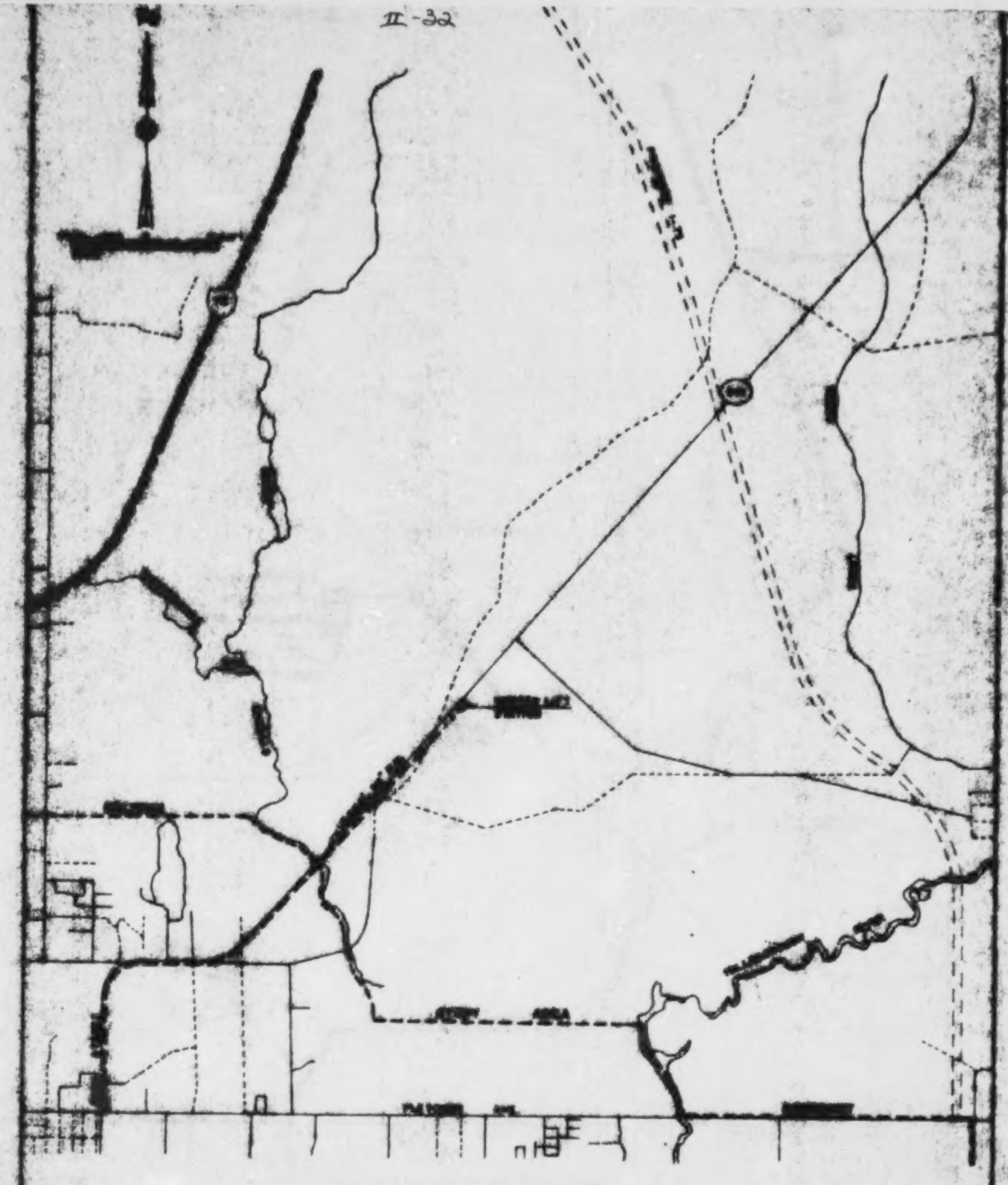
FIGURE II - 17



COUNTY ALTERNATIVE D3

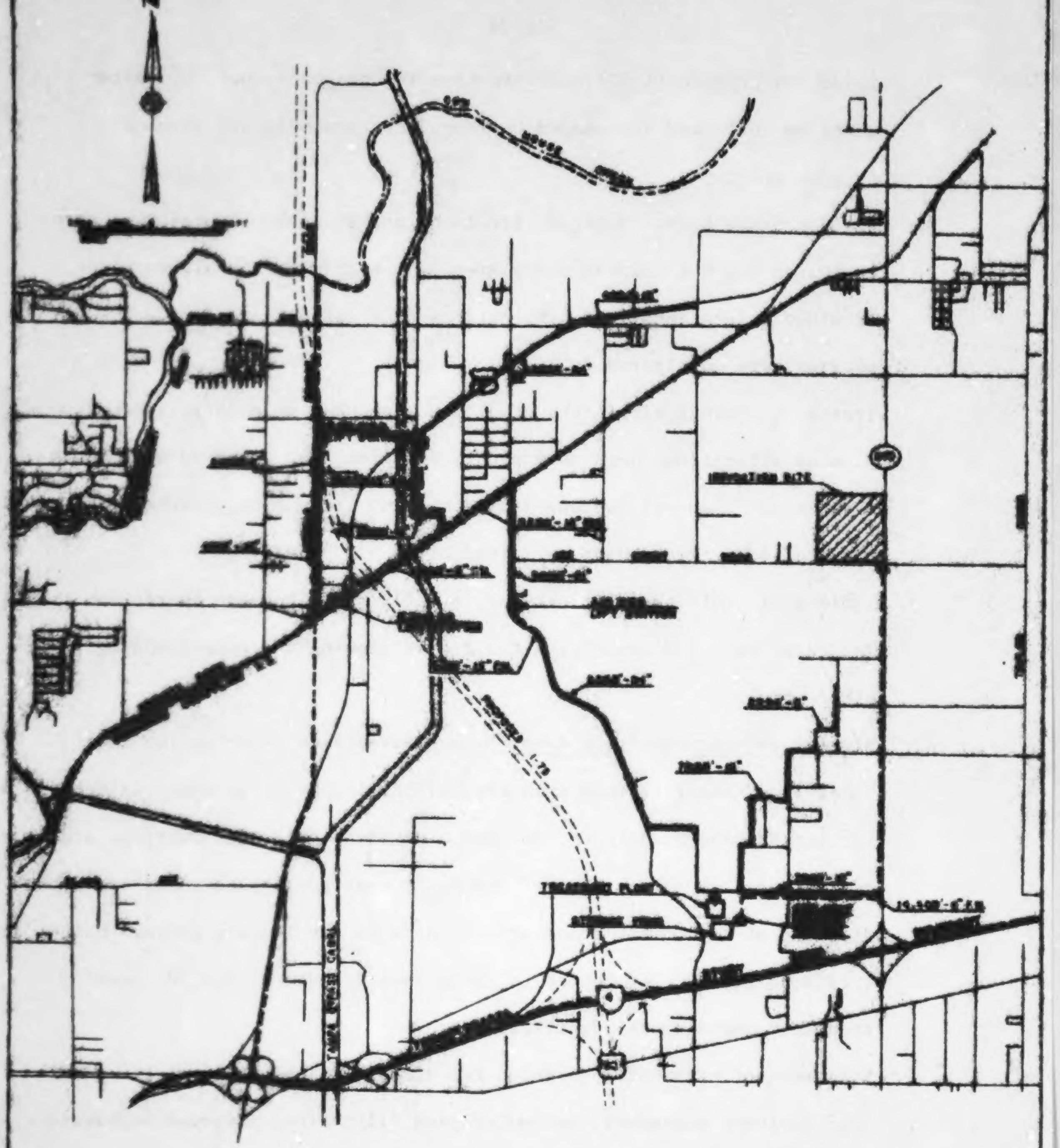
PUMP TO TAMPA

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

CENTRAL HILLSBOROUGH COUNTY - TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA C120634010

[illegible]

FIGURE II-13


N
IRRIGATION SITE
TREATMENT PLANT
14,500'-8" F.M.
I-75
TAMPA BYPASS CANAL

COUNTY ALTERNATIVE T1

SECONDARY TREATMENT/SPRAY IRRIGATION

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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FIGURE II-19

injection (Figure II-20). Alternative T-3 proposes that the wastewater be collected and pumped to Tampa for treatment and disposal (Figure II-21).

3. Brandon Study Area. Numerous treatment and disposal alternatives were evaluated for the Brandon Study Area. In each of these alternatives, treatment, locations, and combinations of treatment and disposal options were considered.

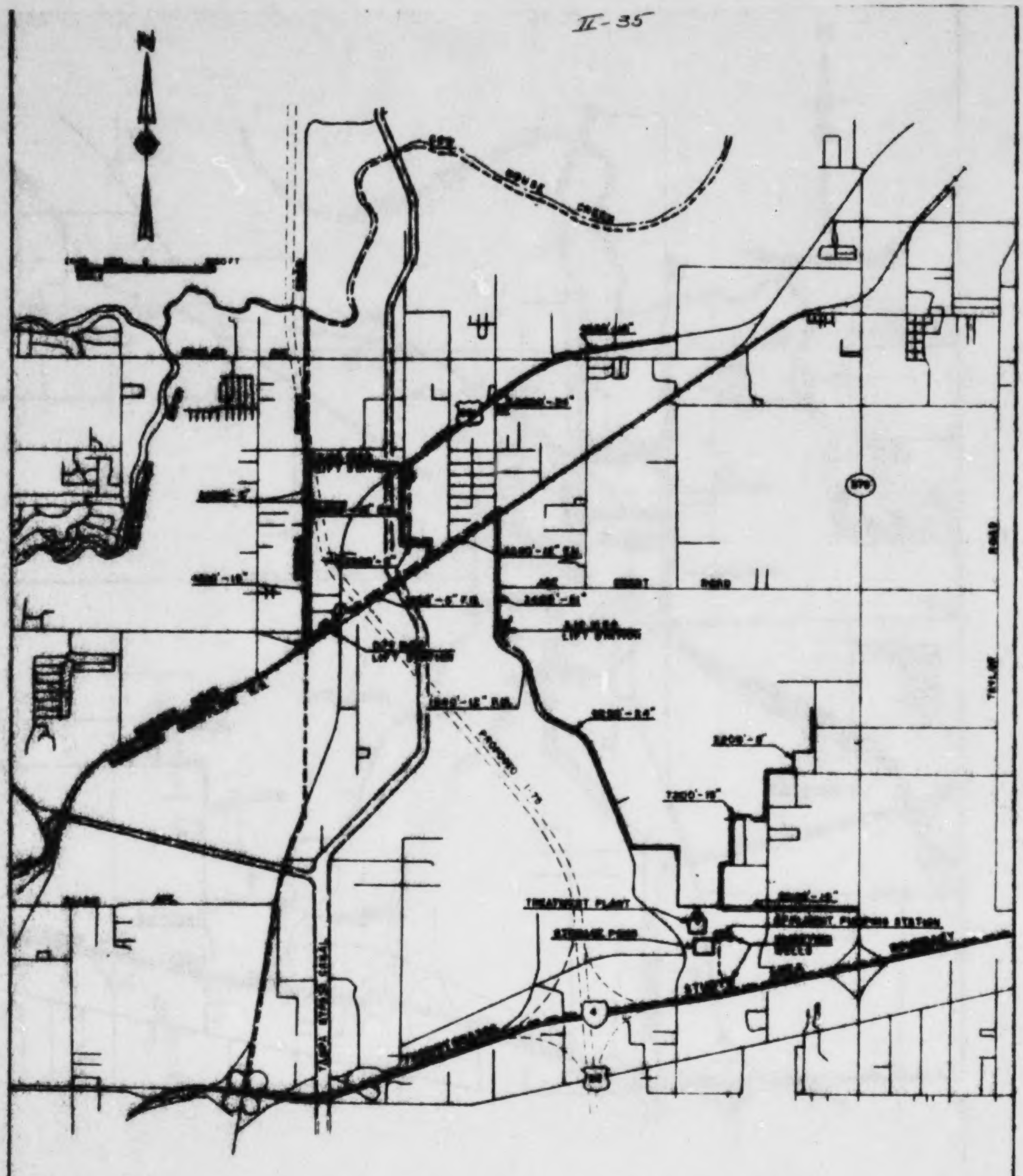
   Treatment options within the study area included secondary, secondary plus nitrification, secondary plus filtration, and advanced wastewater treatment. Disposal options included spray irrigation, discharge to the Alafia River and deep well injection.

   Table II-1 lists the alternatives, briefly describes the characteristics of each and designates the figure showing the corresponding alternative.

4. Riverview-Gibsonton Study Area. The alternatives selected for the Riverview-Gibsonton Study Area are similar in nature to those selected for the Brandon Study Area, in that a combination of alternatives are considered when all or part of the wastewater would be treated and disposed of within the study area, pumped to the Tampa's Hookers Point treatment facility or pumped to the proposed South County 201 Area treatment and disposal facilities.

   Treatment of effluent considered for disposal within the study area includes secondary, secondary plus filtration, advanced wastewater treatment, and secondary plus nitrification.

   Disposal alternatives considered for the study area included discharge to the Alafia River, discharge to Hillsborough Bay, spray irrigation and deep well injection.


N
CREEK
LIFT STATION
LIFT STATION
AVE
ROAD
579
TAYLOR
ROAD
PROPOSED I-75
3200'-8"
7200'-16"
TREATMENT PLANT
STORAGE POND
EFFLUENT PUMPING STATION
INJECTION WELLS
4

COUNTY ALTERNATIVE T2

SECONDARY TREATMENT/ FILTRATION/DEEP WELL INJECTION

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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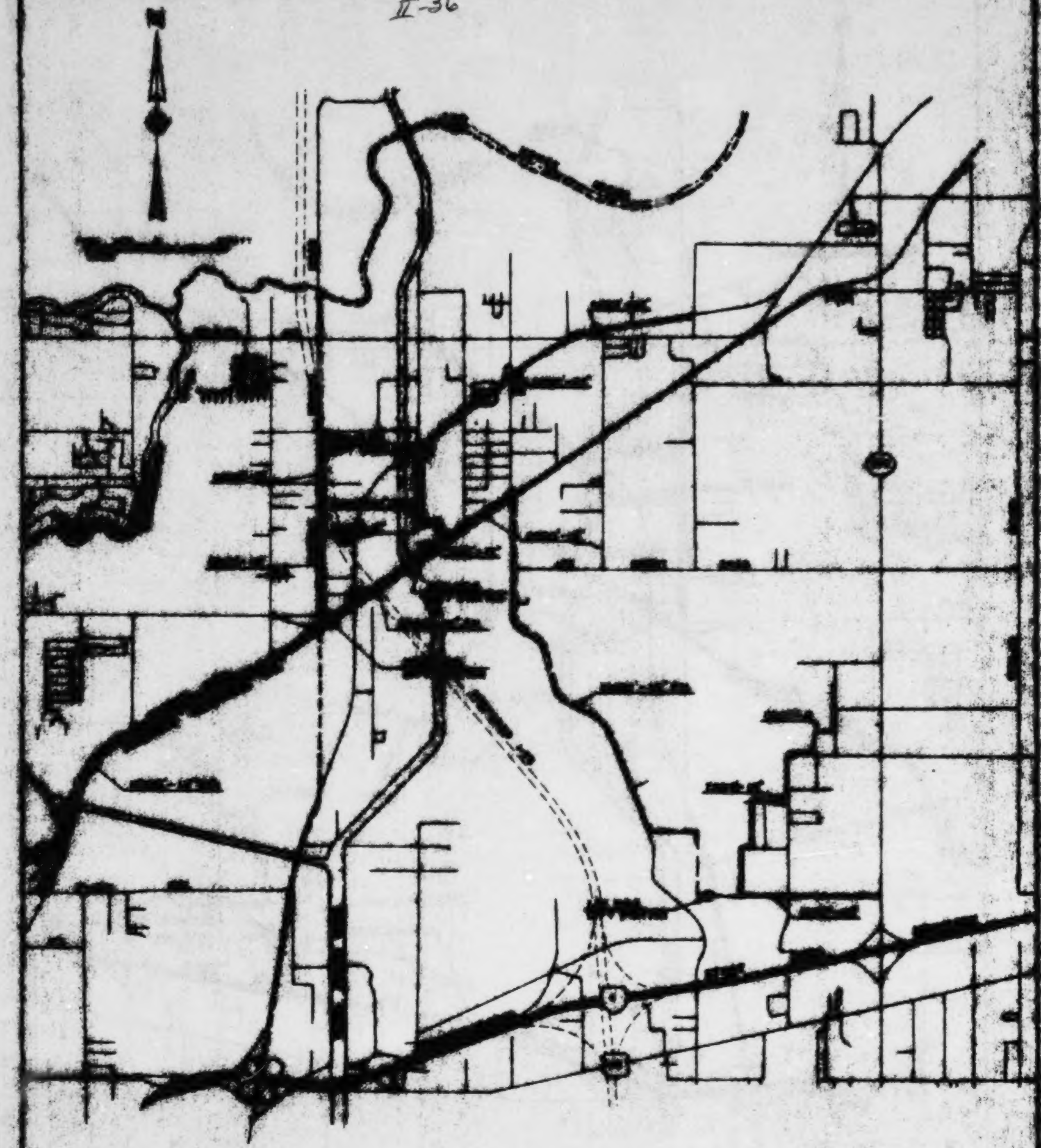
[illegible]
FIGURE II - 20



COUNTY ALTERNATIVE T3

PUMP TO TAMPA

SOURCE :

[illegible]

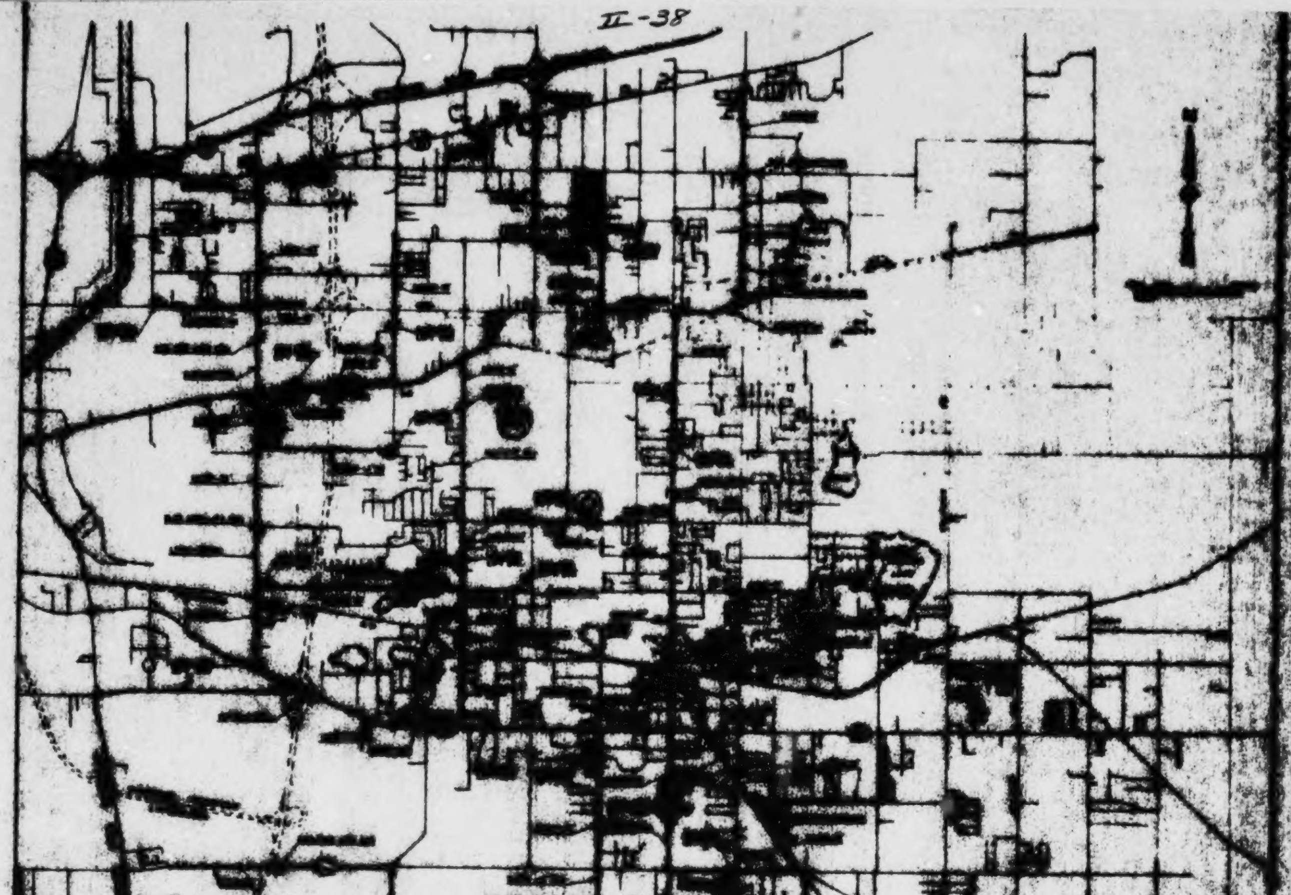
CENTRAL HILLSBOROUGH COUNTY- TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA C120634010 [illegible]

FIGURE II-[illegible]

TABLE II-1

BRANDON STUDY AREA ALTERNATIVES

201 Designation	Million Gallons Per Day Amount To Tampa	Million Gallons Per Day Amount To Study Area	Treatment In Study Area	Disposal Method In Study Area	Figure No.
B-13	9.73	--	--	--	II-34
B-11	7.91	1.82	Secondary	Spray Irrigation	II-32
B-9	7.91	1.82	Secondary & Nitrification	To Alafia River	II-30
B-10	7.91	1.82	Advanced Wastewater Treatment	To Alafia River	II-31
B-12	7.91	1.82	Secondary & Filtration	Deep Well Injection	II-33
B-7	5.60	4.13	Secondary	Spray Irrigation	II-28
B-5	5.60	4.13	Secondary & Nitrification	To Alafia River	II-26
B-6	5.60	4.13	Advance Wastewater Treatment	To Alafia River	II-27
B-8	5.60	4.13	Secondary & Filtration	Deep Well Injection	II-29
B-3	--	9.73	Secondary	Spray Irrigation	II-24
B-1	--	9.73	Secondary & Nitrification	To Alafia River	II-22
B-2	--	9.73	Advanced Wastewater Treatment	To Alafia River	II-23
B-4	--	9.73	Secondary & Filtration	Deep Well Injection	II-25



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EPA No. C120634010

COUNTY ALTERNATIVE B1

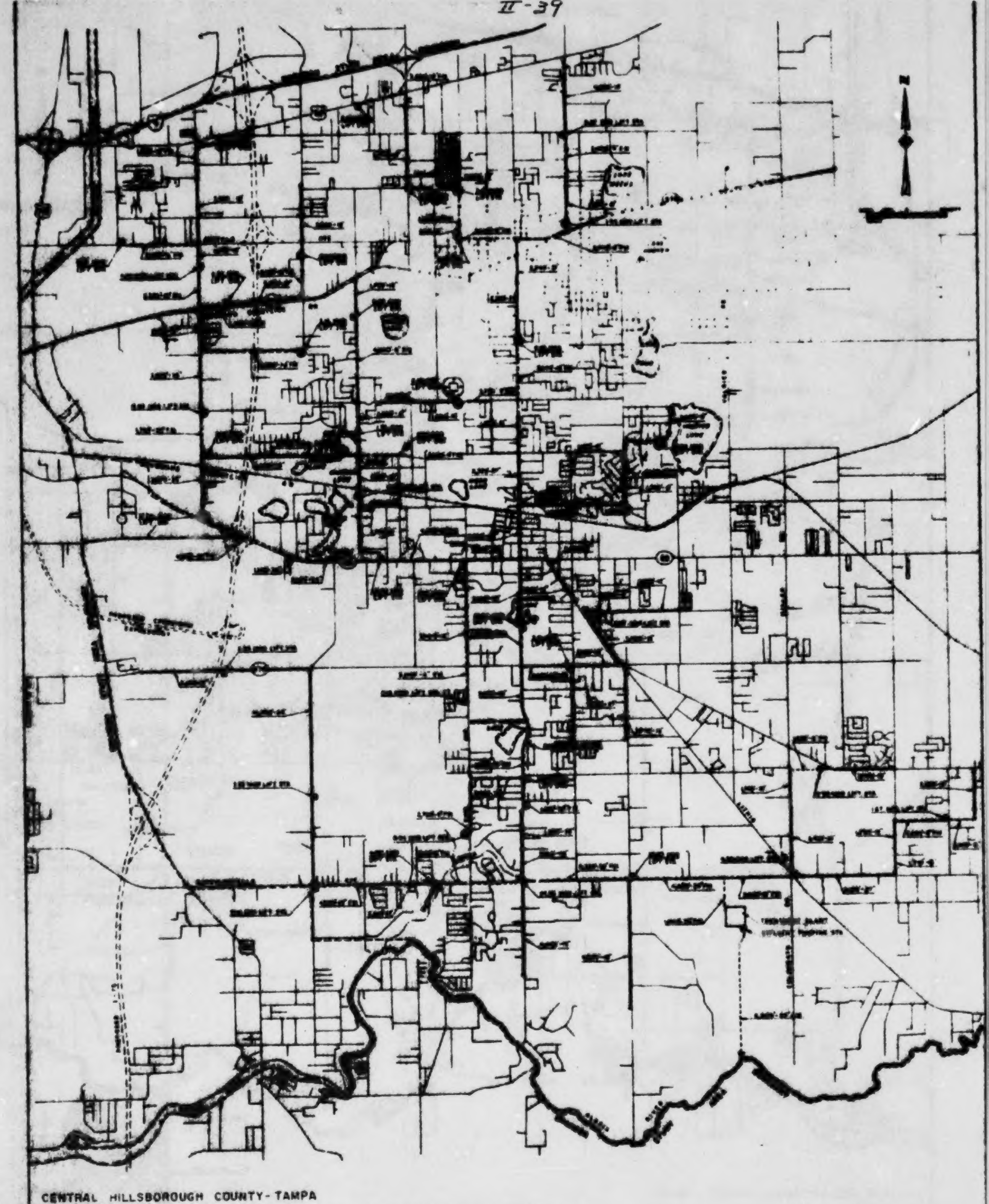
[illegible]

[illegible]

SOURCE:
[illegible]

[illegible]

FIGURE II-[illegible]



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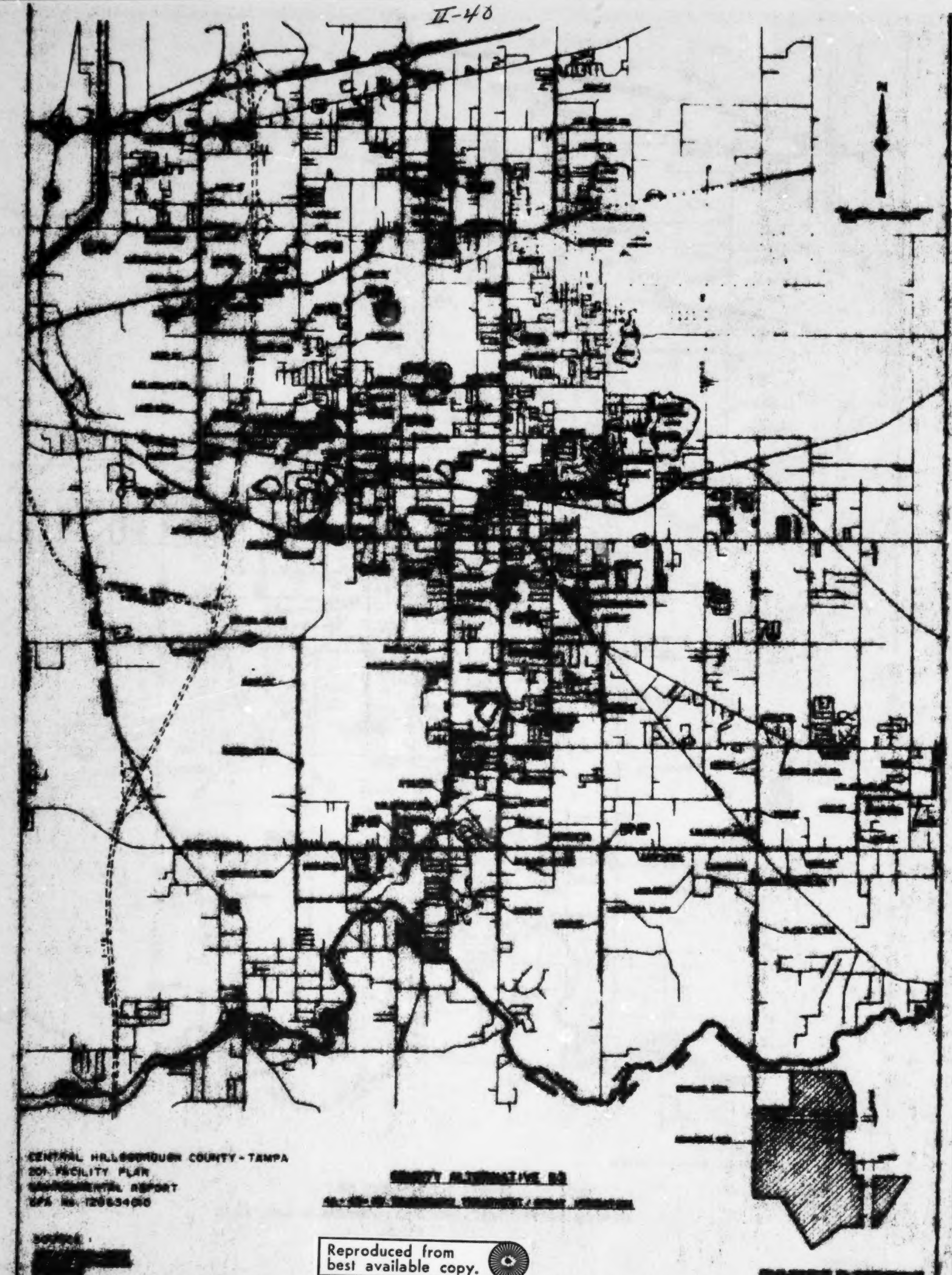
COUNTY ALTERNATIVE B2

4A+4B+4D ADVANCED WASTE TREATMENT / DISCHARGE TO ALAFIA RIVER

SOURCE :
[illegible]

DAMES & MOORE

FIGURE II - 23



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EPA No. 120834010

COUNTY ALTERNATIVE 5B

[illegible]

SOURCE:
[illegible]

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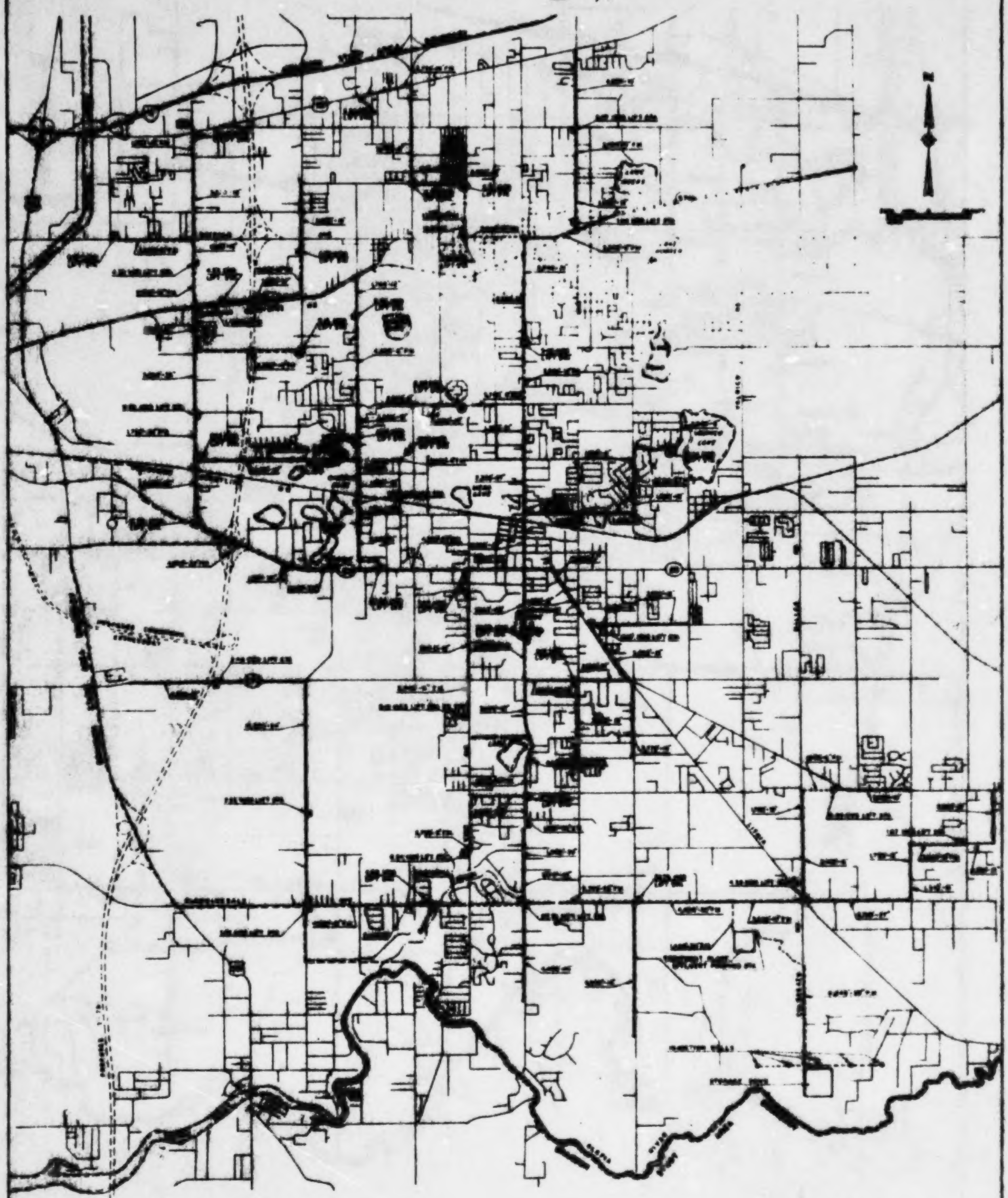
[illegible]

FIGURE II-24



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ENVIRONMENTAL REPORT
EPA NO. C120634010

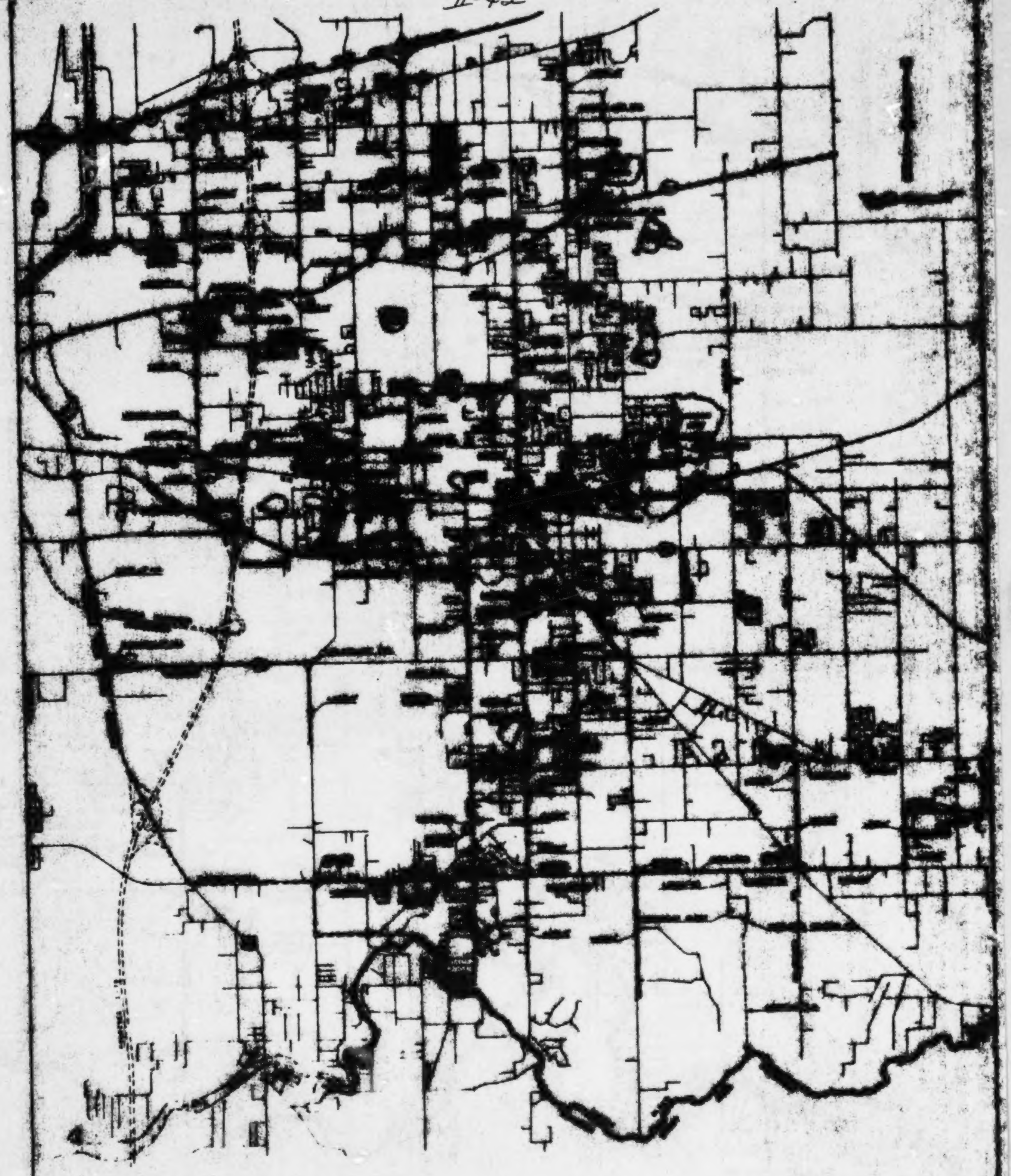
COUNTY ALTERNATIVE B4

4A+4B+4D SECONDARY TREATMENT / FILTRATION / DEEP WELL INJECTION

SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

DAMES & MOORE

FIGURE II -25



CENTRAL HILLSBOROUGH COUNTY - TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120684010

COUNTY ALTERNATIVE 5B

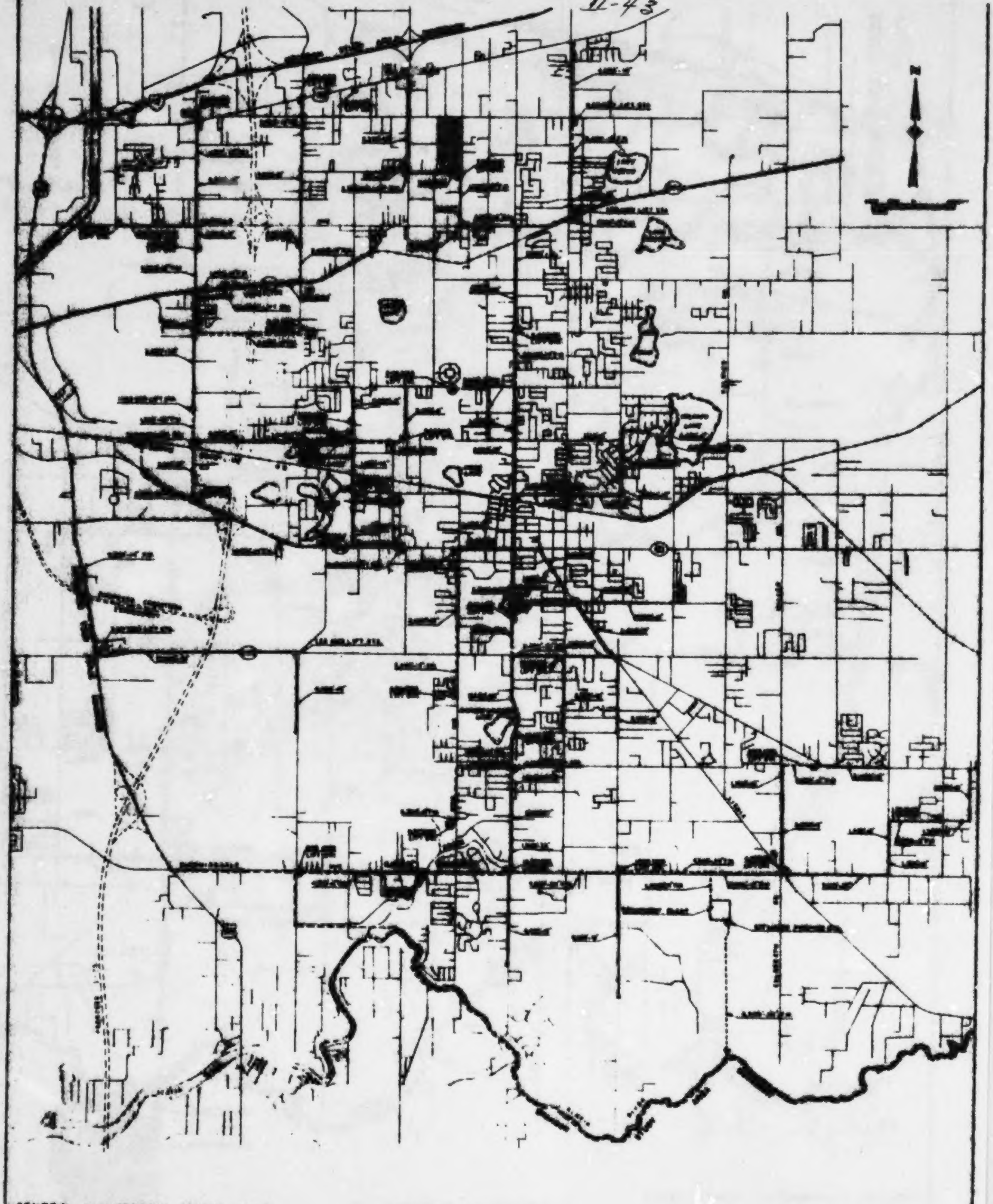
[illegible]

[illegible]

SOURCE :
[illegible]

Reproduced from best available copy.

[illegible]
FIGURE [illegible]



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ENVIRONMENTAL REPORT
EPA NO. C120634010

SOURCE :
[illegible]

COUNTY ALTERNATIVE 8G

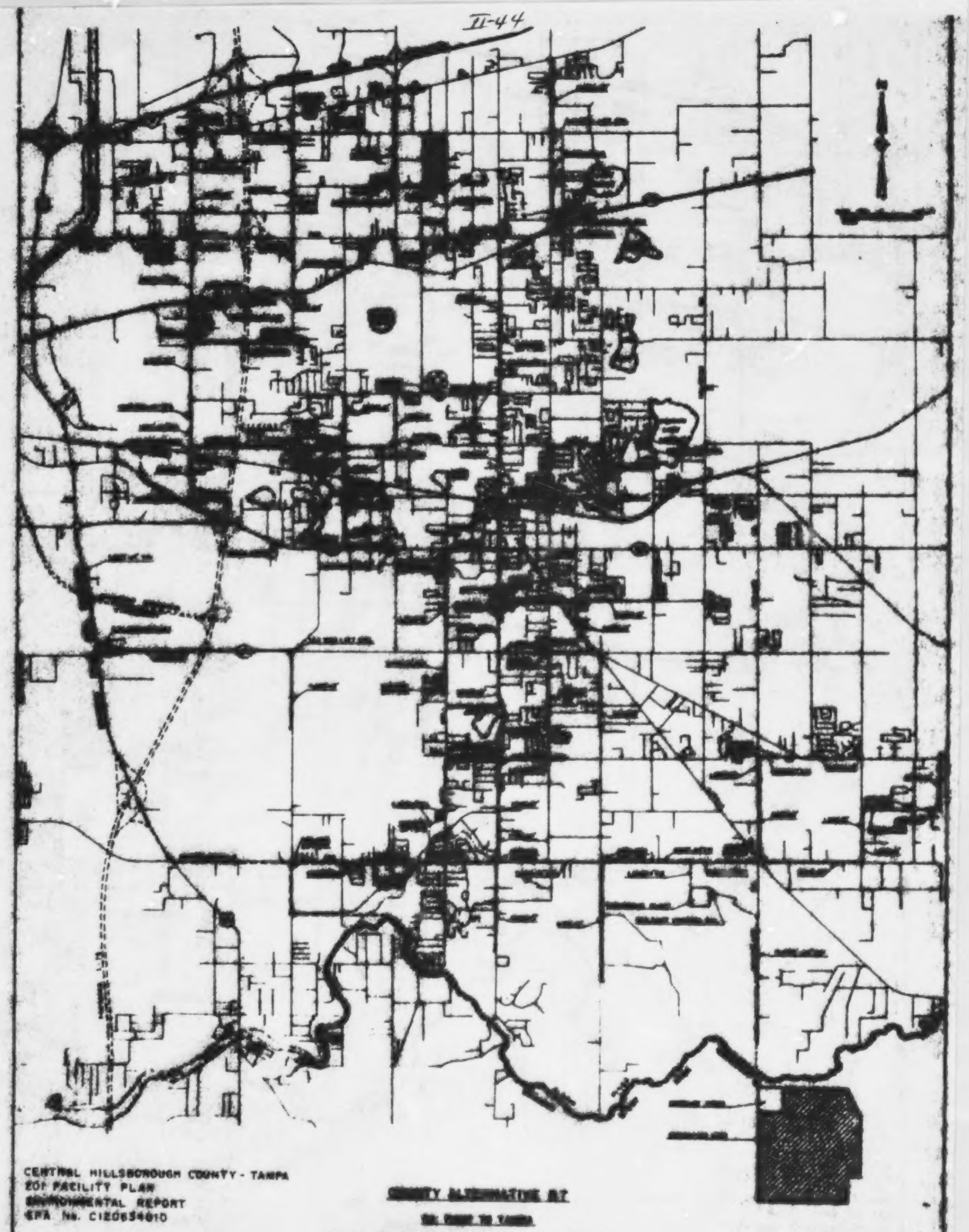
4A: PUMP TO TAMPA

4B+4D: ADVANCED WASTE TREATMENT / DISCHARGE TO ALAFIA RIVER

DAMES & MOORE

FIGURE II-27

II-44



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201 FACILITY PLAN
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COUNTY ALTERNATIVE B7

[illegible]

[illegible] SECONDARY TREATMENT / SPRAY [illegible]

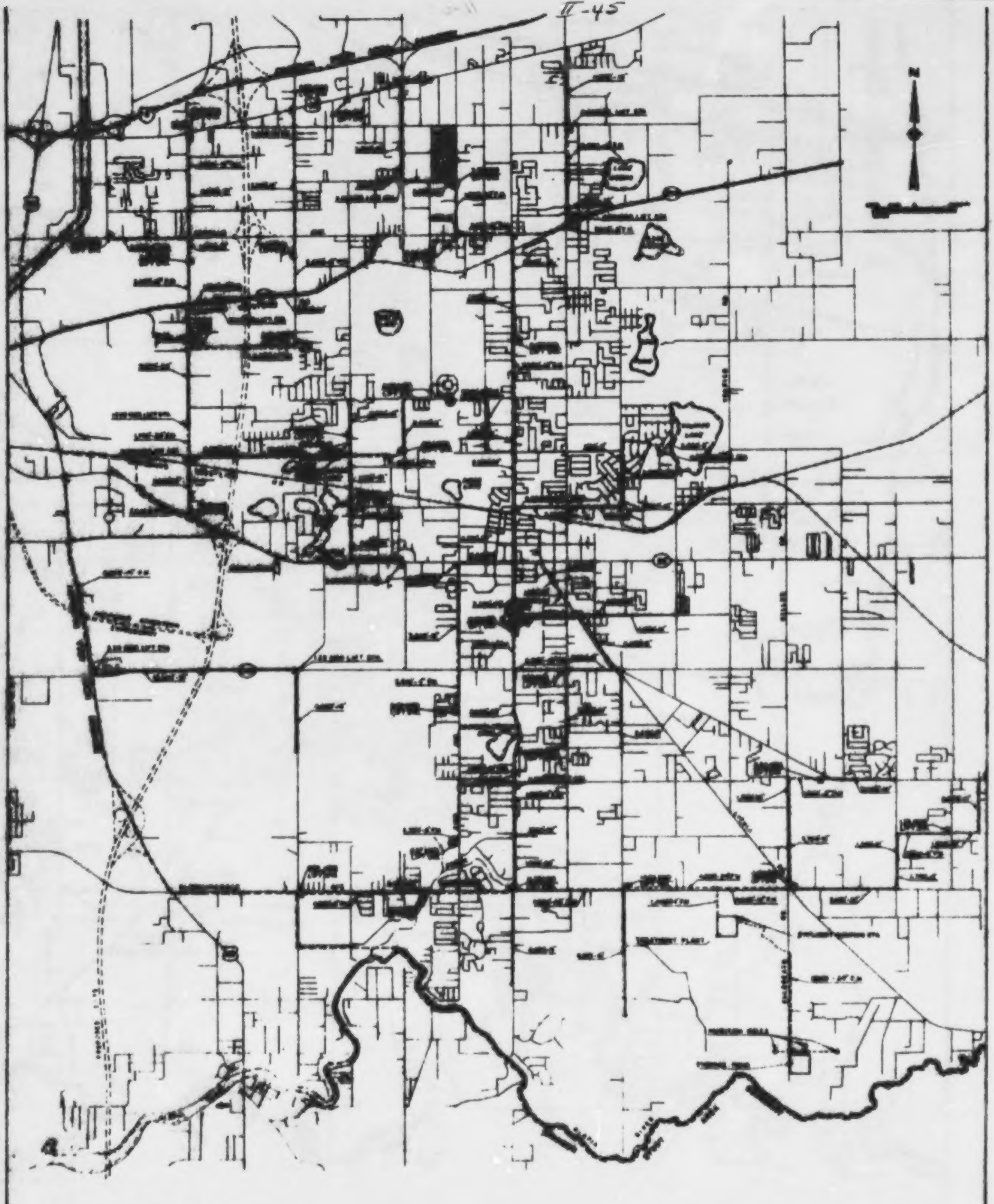
SOURCE :
[illegible]

Reproduced from
best available copy.

[illegible]

FIGURE II-26

II-45



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ENVIRONMENTAL REPORT
EPA No. C120634010

COUNTY ALTERNATIVE 8B

4A: PUMP TO TAMPA

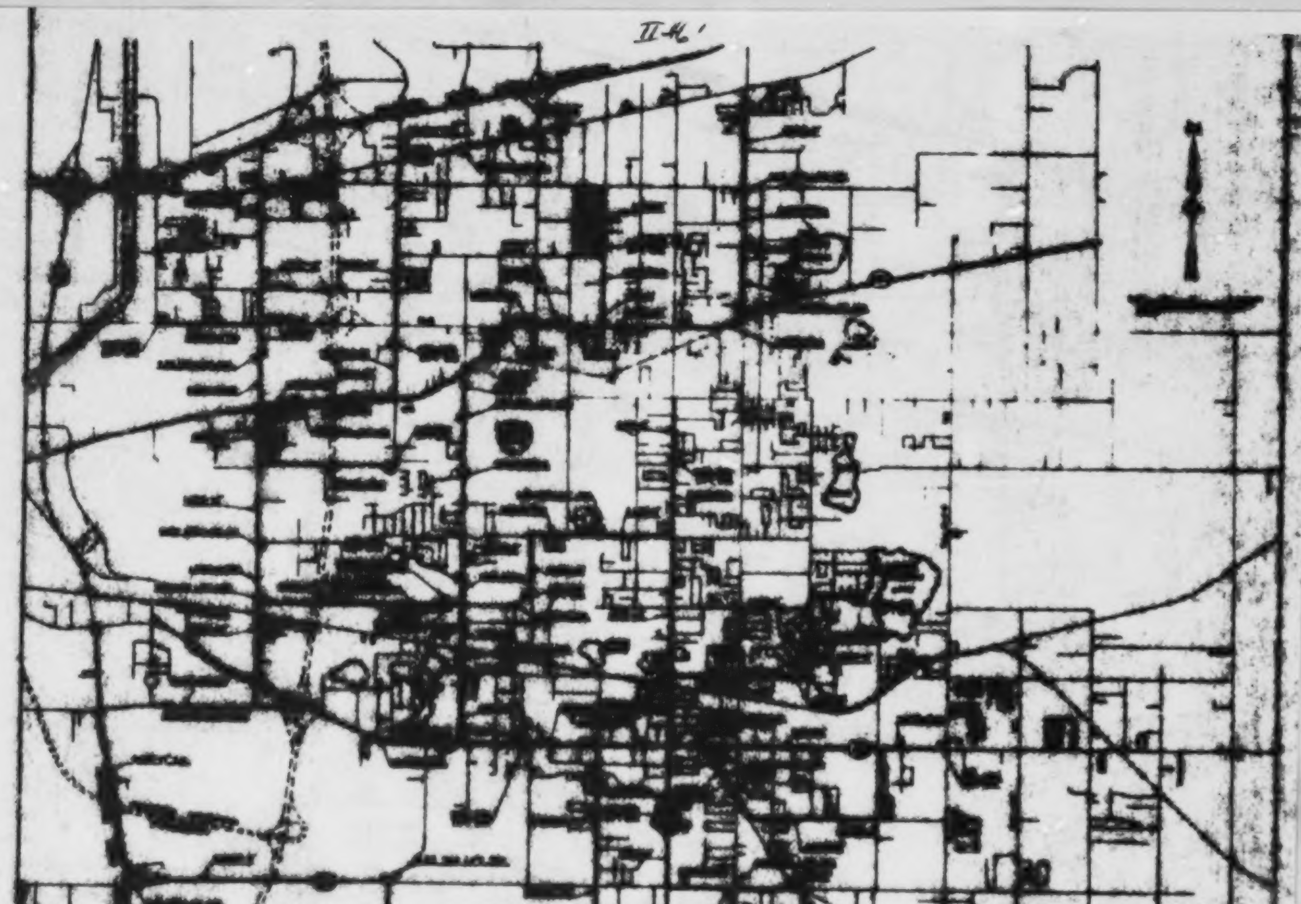
4B+4D: SECONDARY TREATMENT / FILTRATION / DEEP WELL INJECTION

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

DAMES & MOORE

FIGURE II-29

II-46'



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201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120854010

[illegible] ALTERNATIVE [illegible]

[illegible]

[illegible]

SOURCE:
[redacted]

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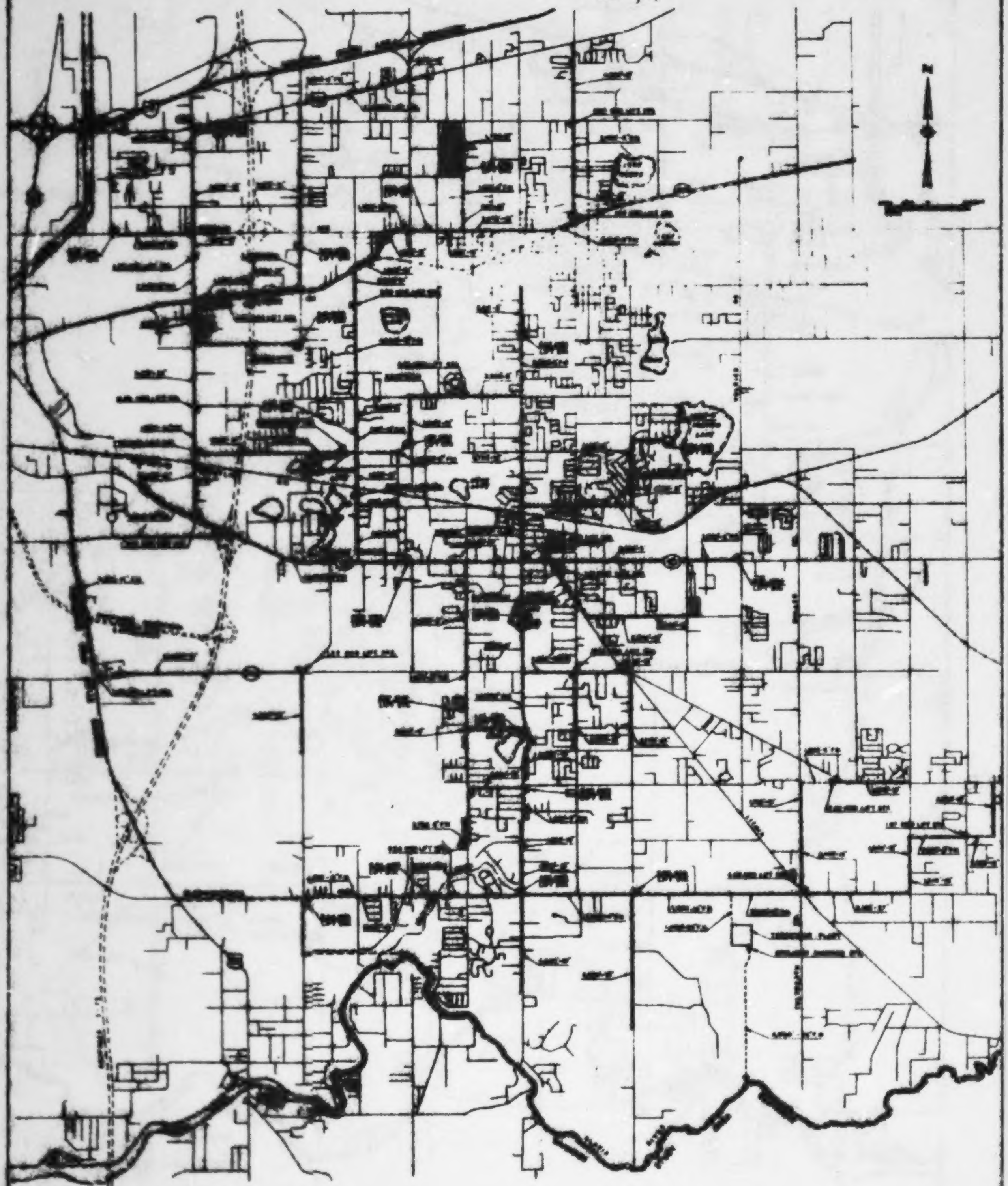
[illegible]

FIGURE 2 - [illegible]



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EPA No. C120634010

COUNTY ALTERNATIVE 8D

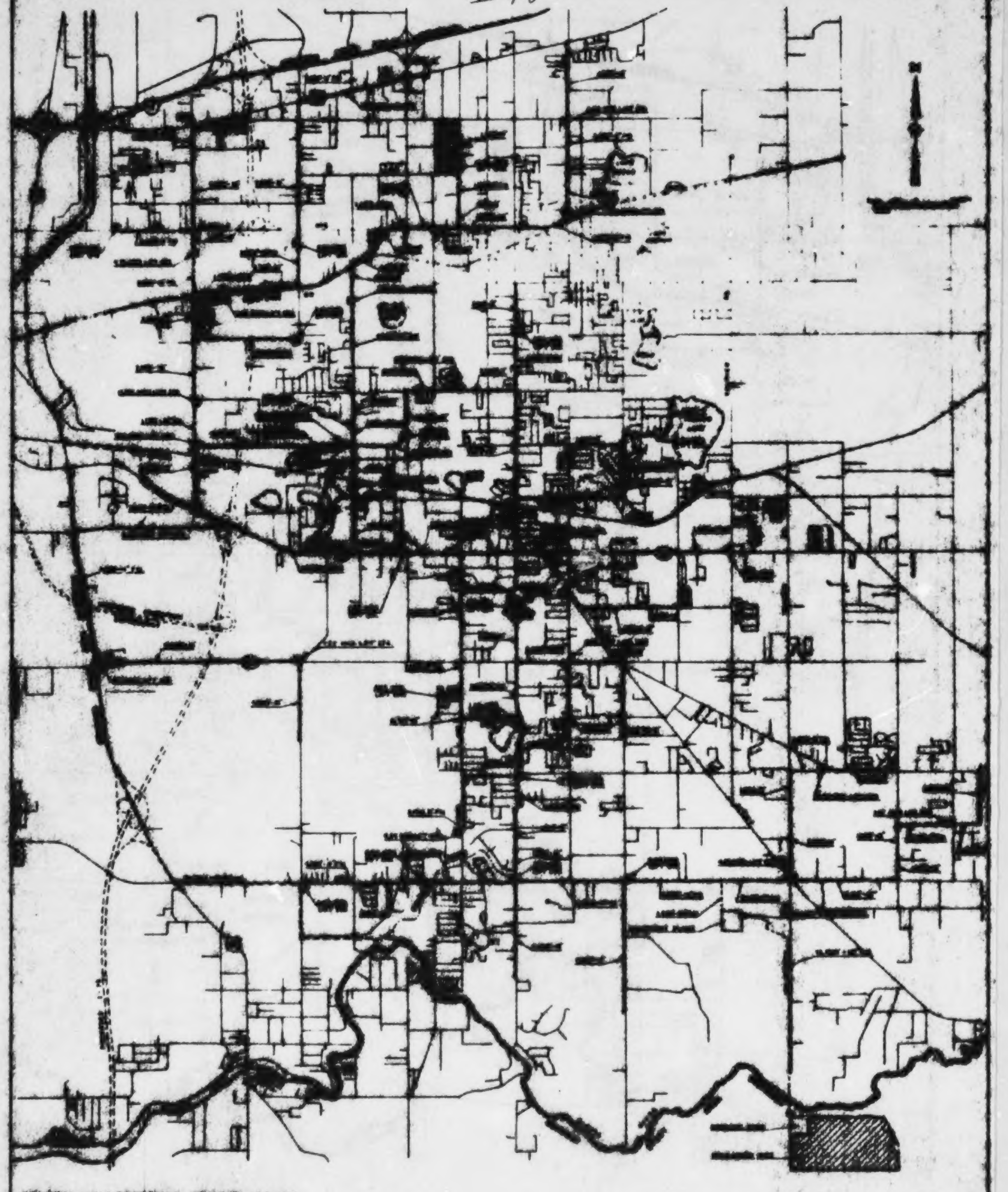
4A+4B: PUMP TO TAMPA

8D ADVANCED WASTE TREATMENT / DISCHARGE TO ALAFIA RIVER

SOURCE:
[illegible]

DAMES & MOORE

FIGURE II-31



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201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

COUNTY ALTERNATIVE [illegible]

[illegible] TO TAMPA

[illegible] TREATMENT / [illegible]

SOURCE:
[illegible]

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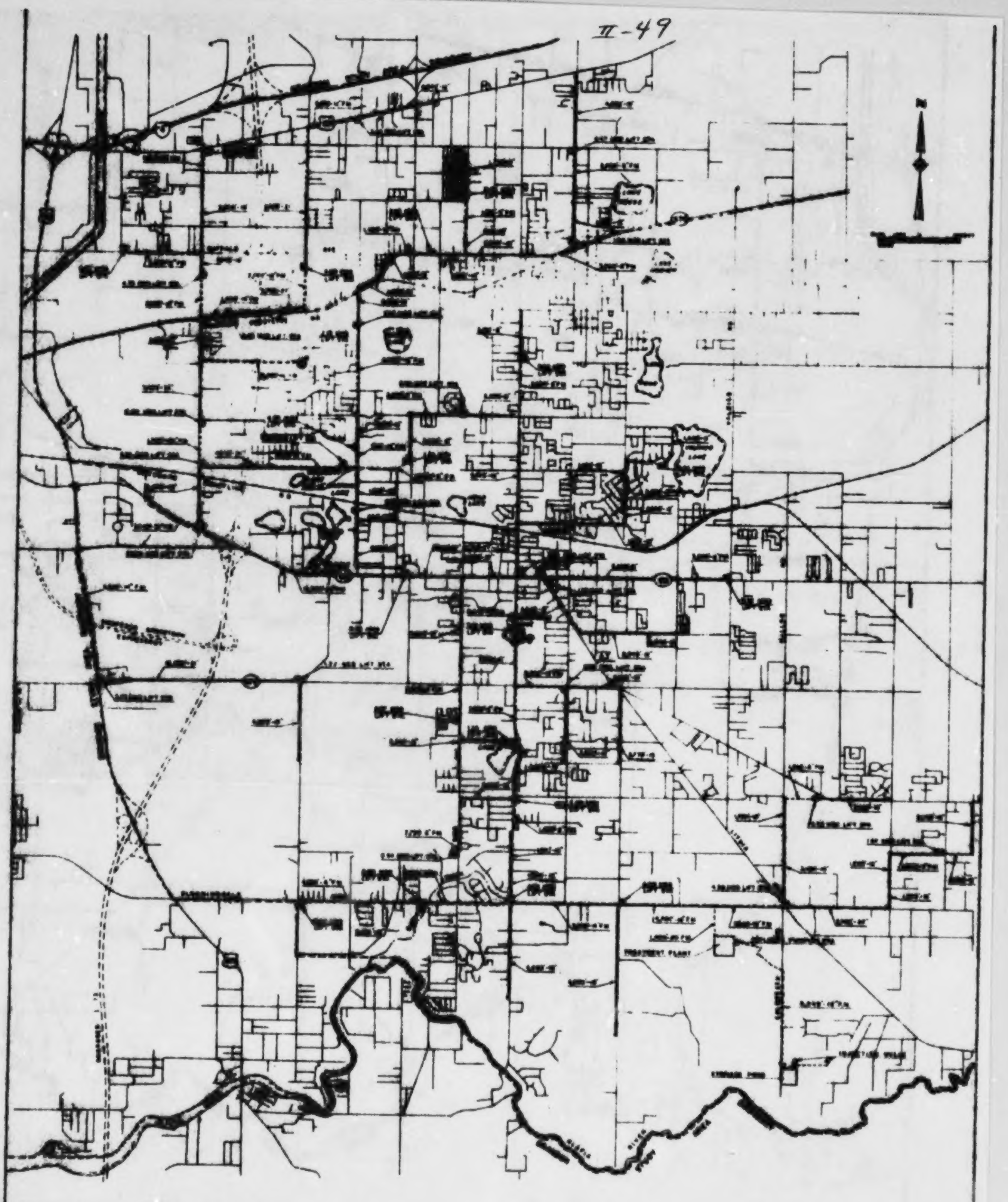
[illegible]

FIGURE II-32



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COUNTY ALTERNATIVE 8I2

4A+4B: PUMP TO TAMPA

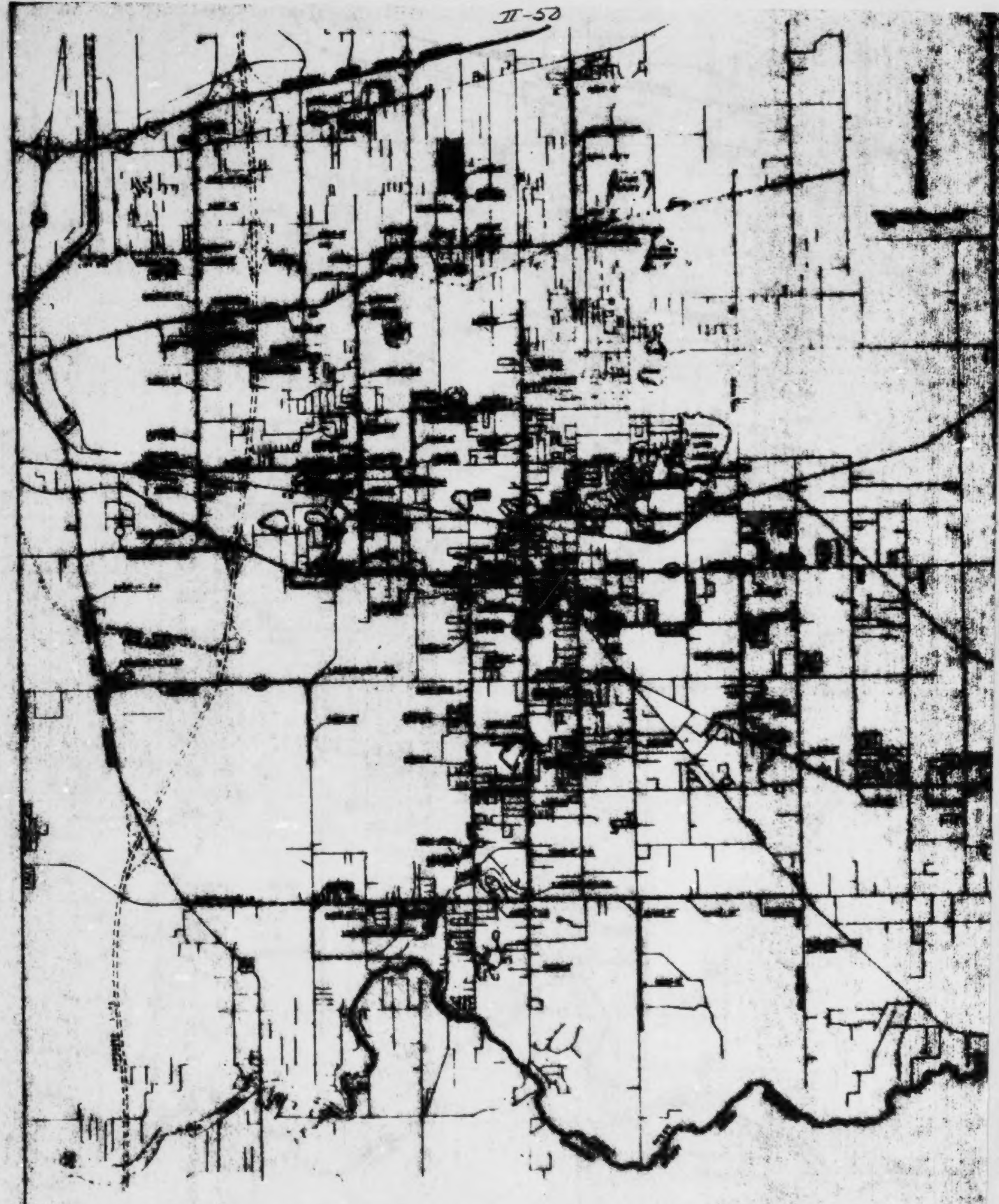
4D SECONDARY TREATMENT / FILTRATION / DEEP WELL INJECTION

SOURCE :
[illegible]

[illegible]

FIGURE II-33

II-50



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201 FACILITY PLAN
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EPA No. C120654010

[illegible]

[illegible]

SOURCE :
[illegible]

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[illegible]

Table II-2 lists and describes the numerous alternatives considered for the Riverview-Gibsonton Study Area and references the corresonding figures. The 201 Facility Plan and Study Memorandum Number 8 of the Facility Plan present further descriptions of the alternatives.

II. 3.3 Non-Structural Alternatives

Several basic non-structural approaches exist for controlling the impact of a regional sewerage system. These include:

1. Financing of the system
2. Phasing of system construction
3. Land use regulation (i.e., zoning, subdivision regulations, permitting, mandatory reviews, etc.).
4. Governmental intervention (i.e., purchasing of easements, land acquisition or land banking, federal grants, taxing policy).

The first two approaches are positive in that they do not require active governmental intervention (that is, rule against an action or governmental purchase of land). The latter alternatives, forms of governmental intervention, often require political consensus which is often difficult to obtain and unstable over time.

With the first two approaches, once the policy is set, less governmental intervention is needed. These approaches should:

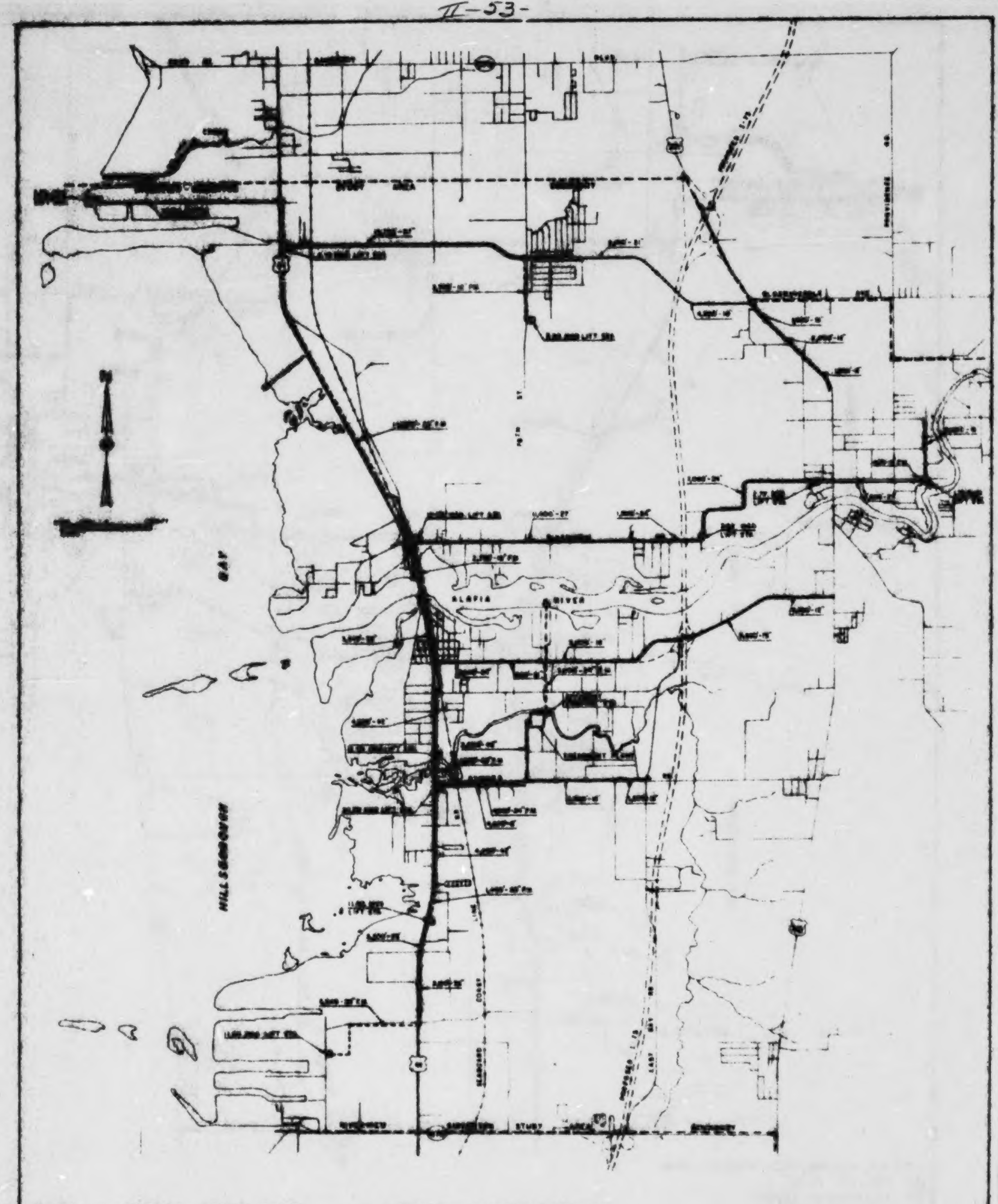
1. Support the Horizon 2000 Plan
2. Minimize the subsidization of future growth
3. Minimize the pressure for suburban sprawl.

The alternatives should be selected so as to implement these policies in as many ways as possible.

TABLE II-2

RIVERVIEW-GIBSONTON STUDY AREA ALTERNATIVES

201 Designation	Amount To Tampa	Amount To Study Area	Amount To South County	Treatment In Study Area	Disposal Method In Study Area	Figure No.
RG-6	5.85	--	--	--	--	II-40
RG-11	2.29	3.56	--	Secondary	Spray Irrigation	II-45
RG-12	2.29	3.56	--	Secondary & Filtration	Deep Well Injection	II-46
RG-8	2.29	3.56	--	Secondary & Nitrification	To Alafia River	II-42
RG-9	2.29	3.56	--	Advanced Wastewater Treatment	To Alafia River	II-43
RG-10	2.29	3.56	--	Advanced Wastewater Treatment	To Hillsborough Bay	II-44
RG-4	--	5.85	--	Secondary	Spray Irrigation	II-38
RG-5	--	5.85	--	Secondary & Filtration	Deep Well Injection	II-39
RG-1	--	5.85	--	Secondary & Nitrification	To Alafia River	II-35
RG-2	--	5.85	--	Secondary & Nitrification	To Alafia River	II-36
RG-3	--	5.85	--	Advanced Wastewater Treatment	To Hillsborough Bay	II-37
RG-7	--	--	5.85	--	--	II-41
RG-13	2.29	--	3.56	--	--	II-47


HILLSBOROUGH
BAY
ALAFIA
RIVER
STUDY AREA
STUDY AREA

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COUNTY ALTERNATIVE RG1

3A + 3E SECONDARY TREATMENT (NITRIFICATION)/

DISCHARGE TO ALAFIA RIVER

SOURCE:
[illegible]

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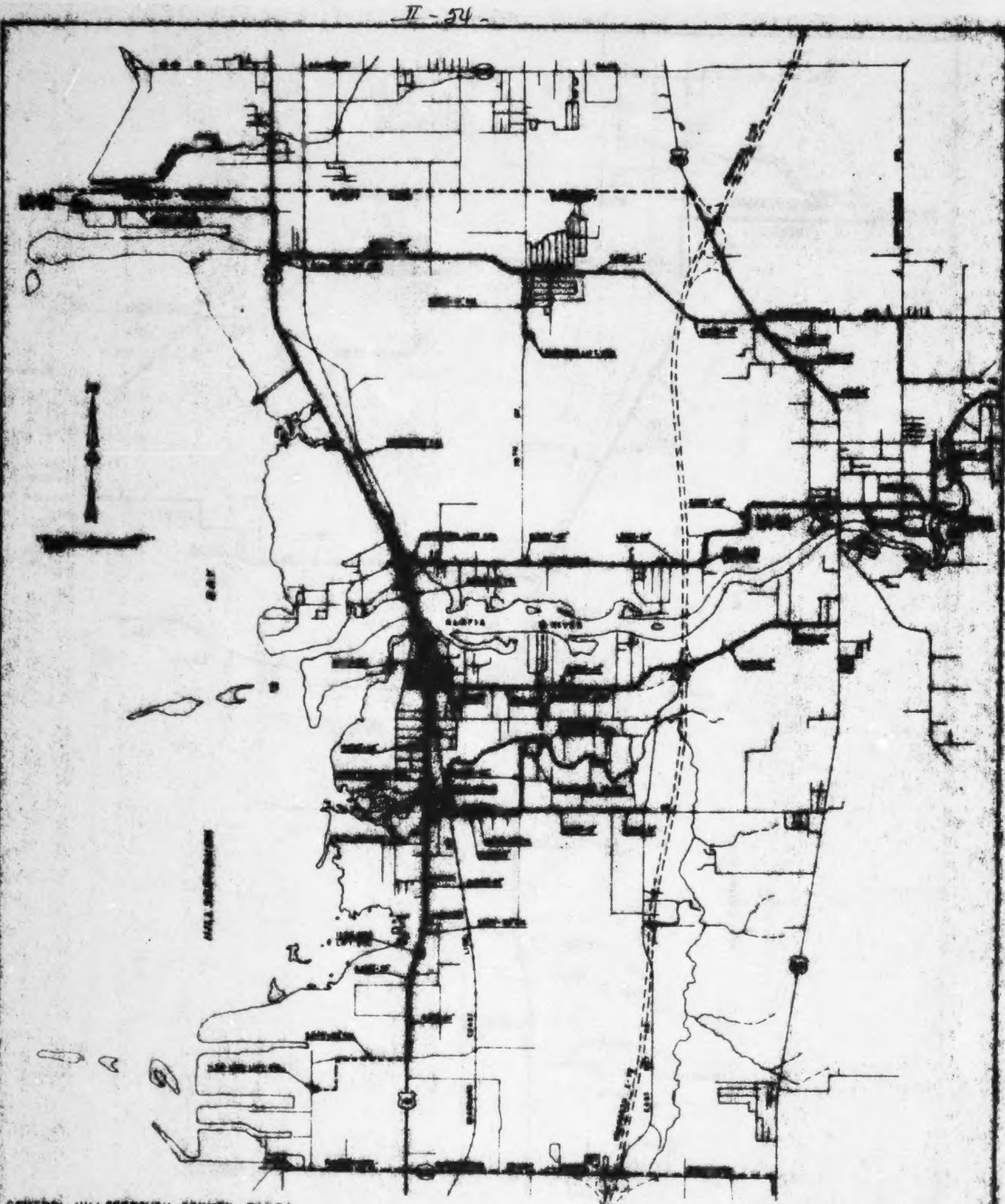
[illegible]

FIGURE II - 39


BAY
HILLSBOROUGH
RIVER

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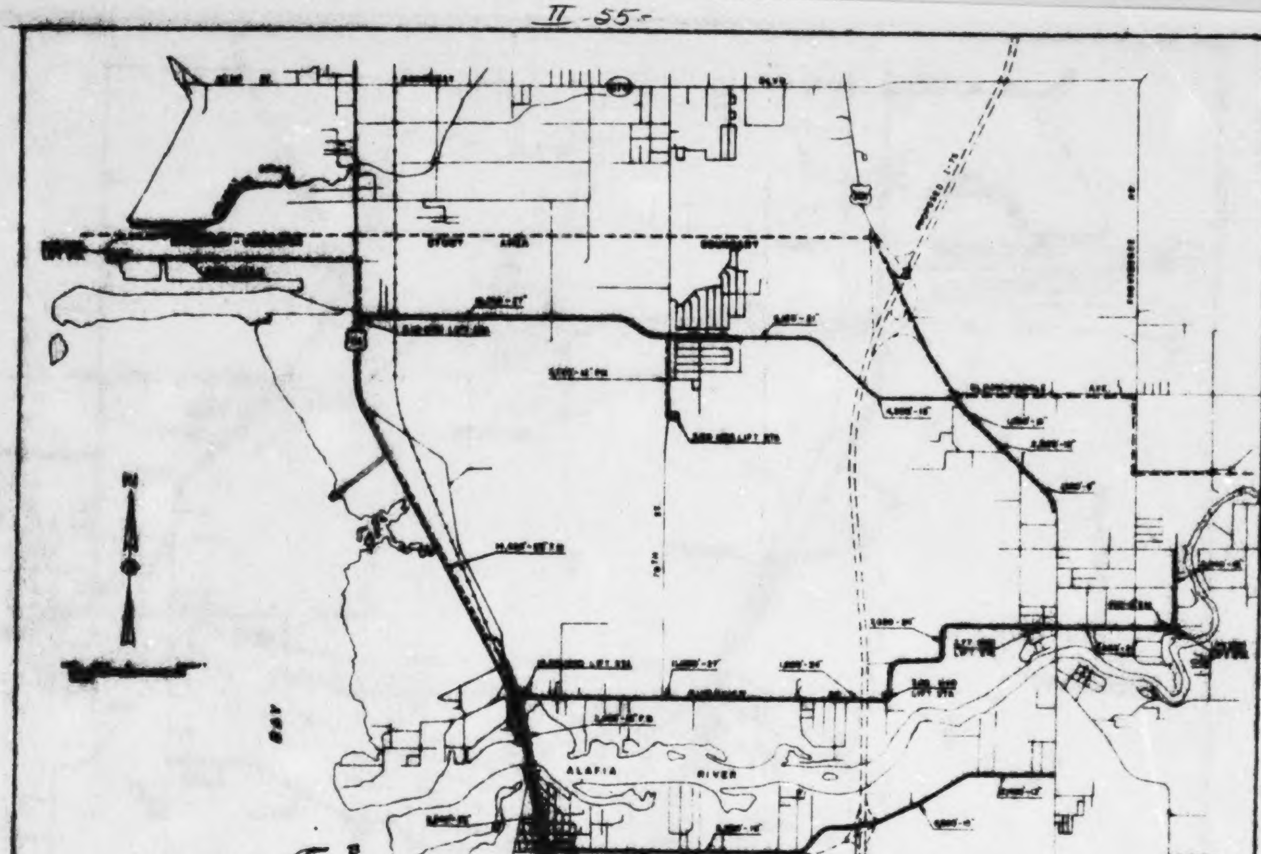
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120934010

COUNTY ALTERNATIVE [illegible]
[illegible] ADVANCED WASTE TREATMENT/
[illegible]

SOURCE:
[illegible]

[illegible]
FIGURE 2 - 34


ALAFIA RIVER
HILLSBOROUGH BAY
STUDY AREA
BOUNDARY
78TH ST
PROPOSED I-75
EAST BAY RD
COAST LINE

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COUNTY ALTERNATIVE RG3

5A + 5B: ADVANCED WASTE TREATMENT/
DISCHARGE TO HILLSBOROUGH BAY

SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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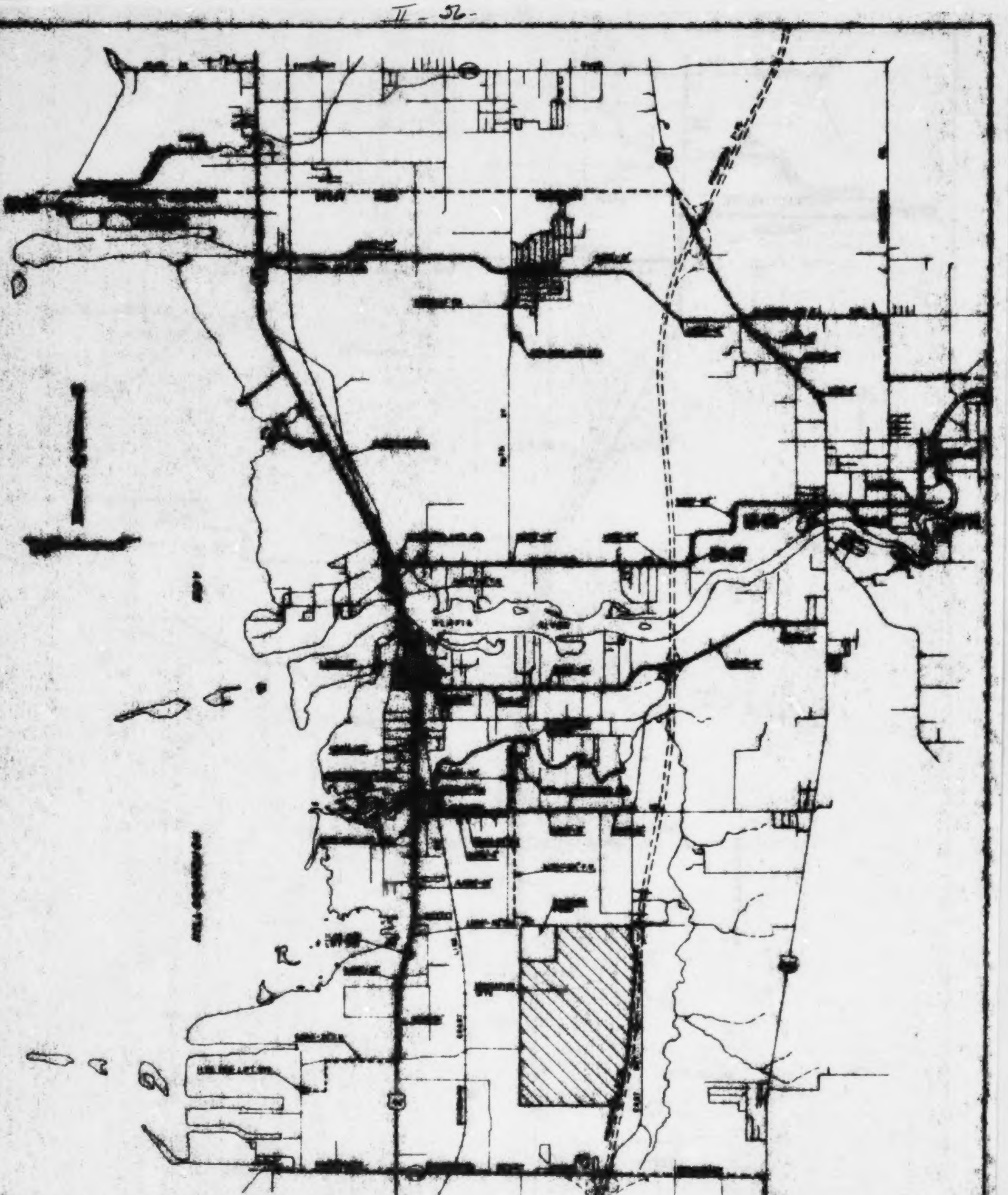
DAMES & MOORE

FIGURE II - 37



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EPA No. C120634010

COUNTY ALTERNATIVE [illegible]

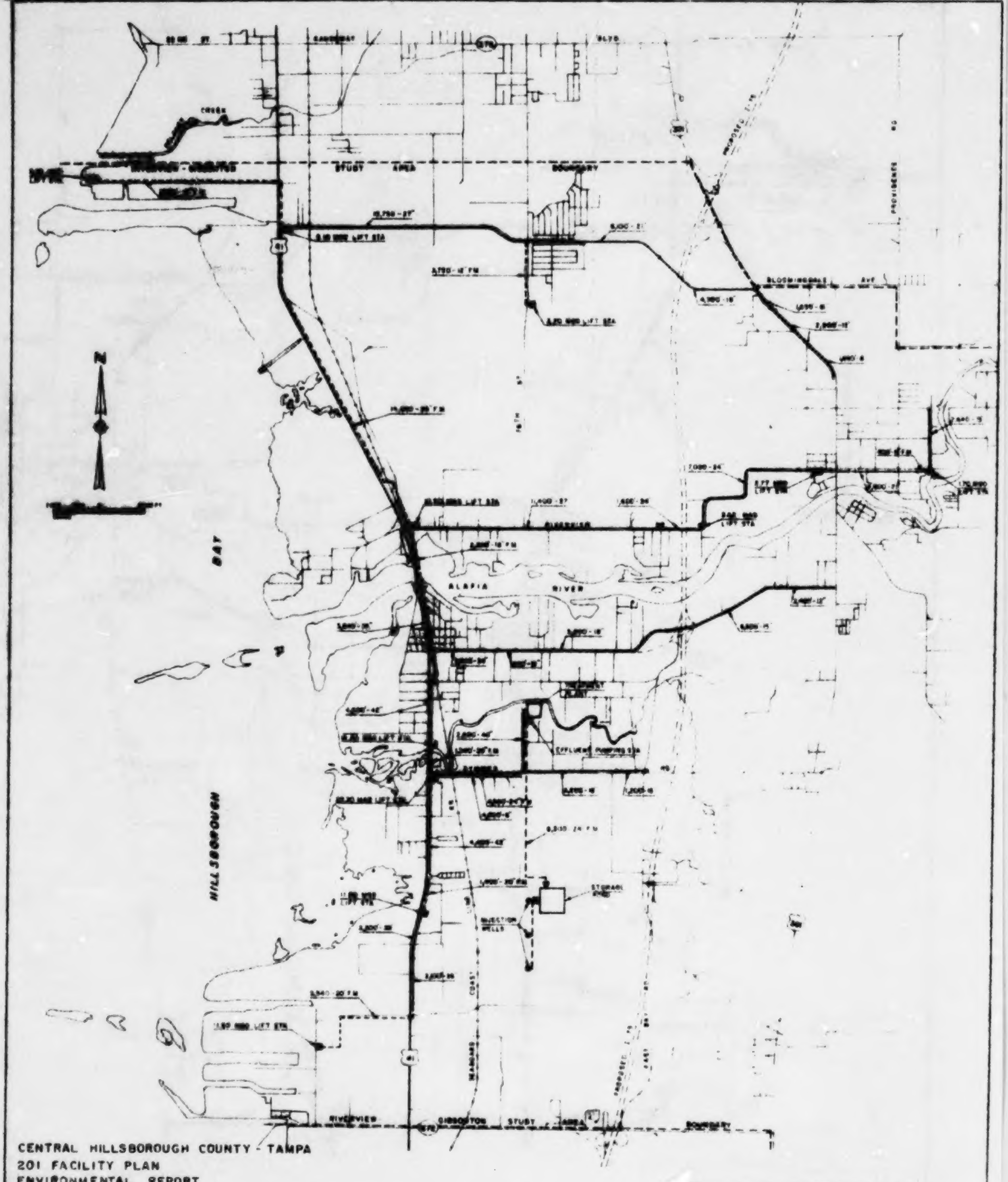
[illegible]

[illegible]

SOURCE :
[illegible]

[illegible]

FIGURE II - 15


CREEK
STUDY AREA BOUNDARY
15,750 - 27"
3.10 MGD LIFT STA
41
4,750 - 12" FM
3.20 MGD LIFT STA
9,100 - 21"
BLOOMINGDALE AVE
4,350 - 18"
PROPOSED I-75
PROVIDENCE RD
N
14,000 - 20" FM
BAY
ALAFIA RIVER
7,000 - 24"
LIFT STA
EFFLUENT PUMPING STA
6,310 24" FM
STORAGE AREA
INJECTION WELLS
HILLSBOROUGH
COAST
SEABOARD
1.50 MGD LIFT STA
RIVERVIEW
GIBSONTON
STUDY AREA BOUNDARY

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COUNTY ALTERNATIVE RG5

5A + 5B: SECONDARY TREATMENT / FILTRATION / DEEP WELL INJECTION

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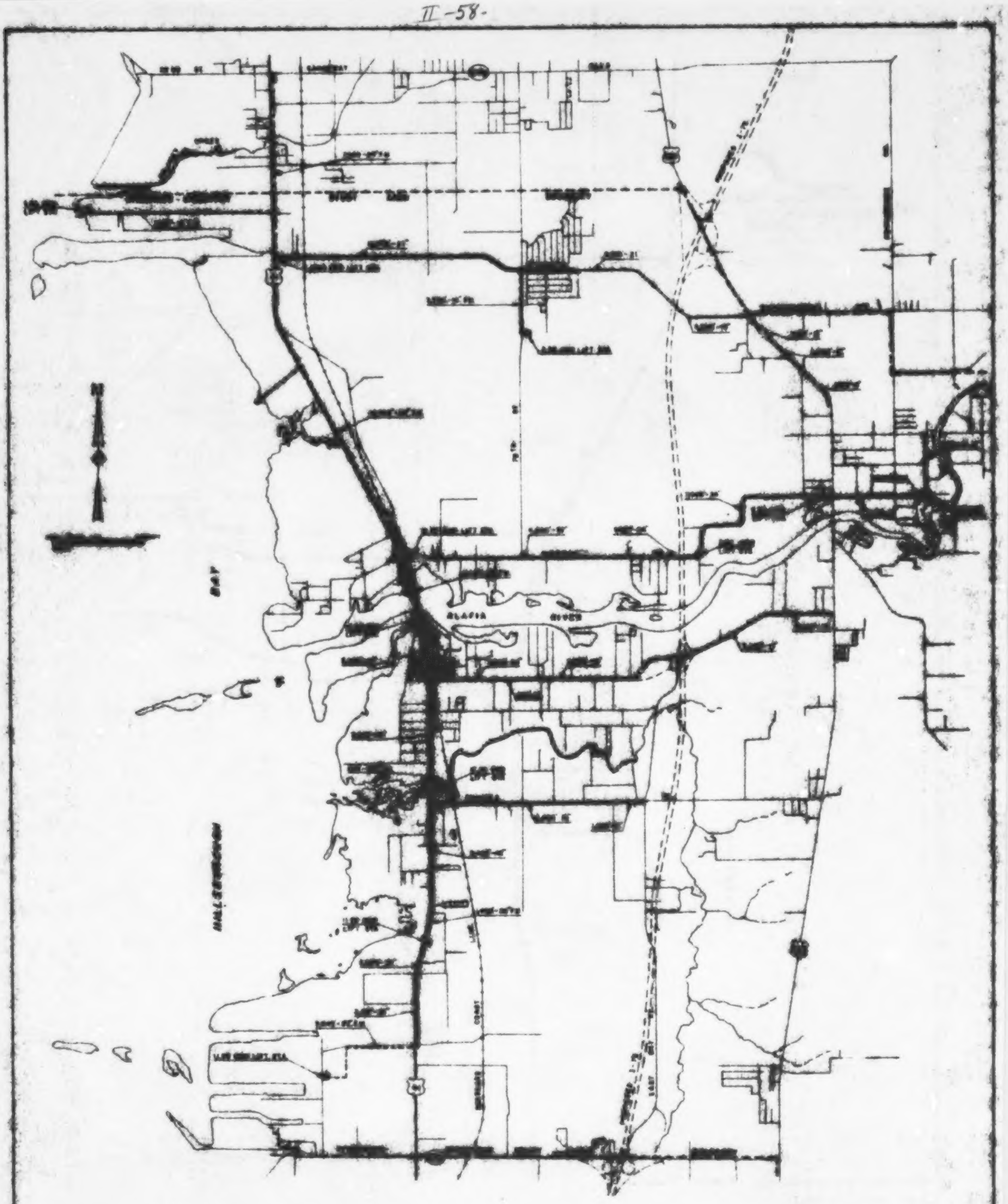
SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

DAMES & MOORE
FIGURE II-39


BAY
HILLSBOROUGH
ALAFIA RIVER

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201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

COUNTY ALTERNATIVE 5A&B

5A: PUMP TO TAMPA

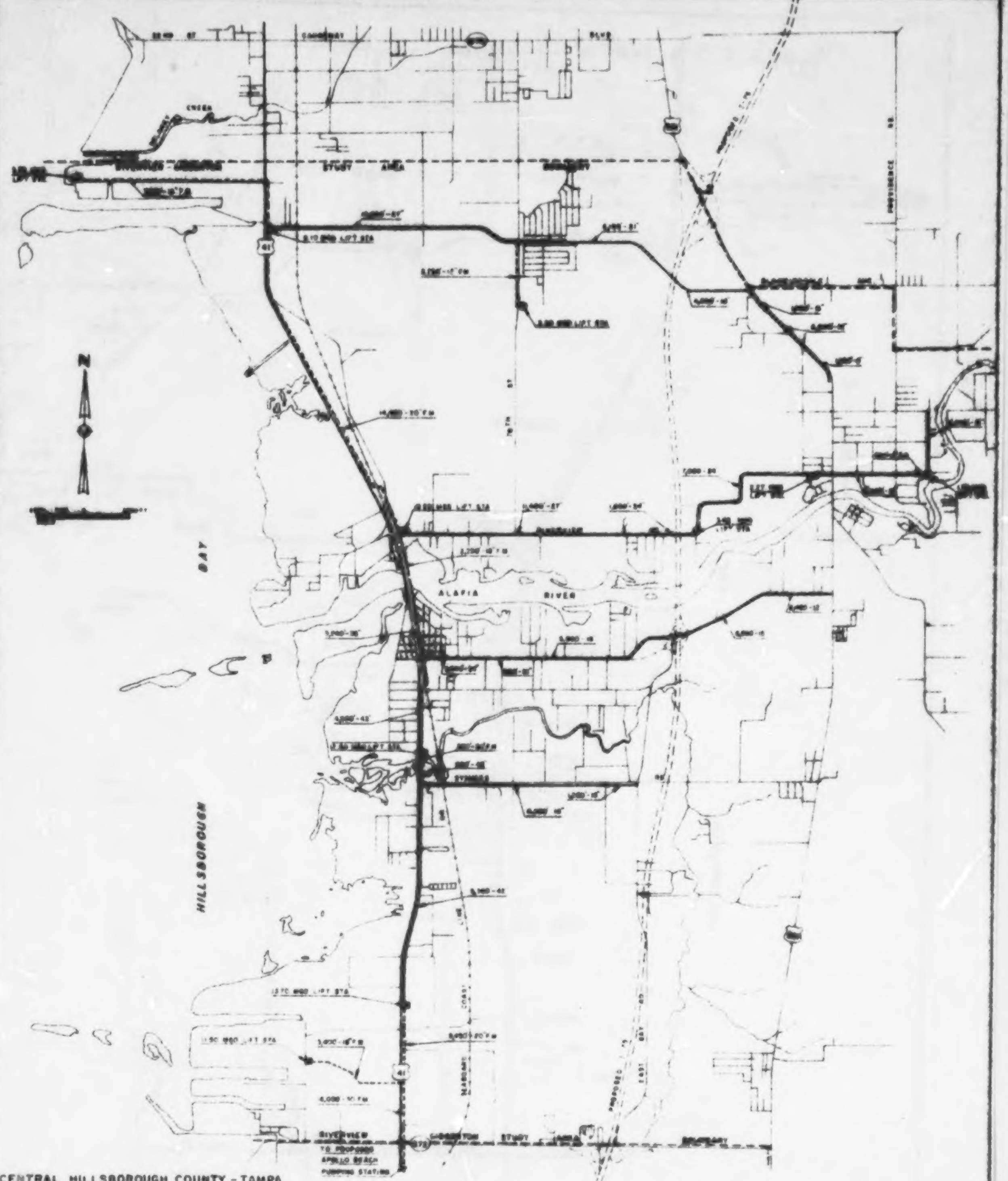
5B: PUMP TO TAMPA

SOURCE :
[illegible]

DAMES & MOORE

FIGURE II-40

II-59.


N
HILLSBOROUGH
BAY
ALAFIA
RIVER
CREEK
STUDY AREA
41
78TH ST
PROVIDENCE RD
GIBSONTON
STUDY
BOUNDARY
RIVERVIEW
TO PROPOSED
APOLLO BEACH
PUMPING STATION

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COUNTY ALTERNATIVE RG7

5A + 5B PUMP TO SOUTH COUNTY

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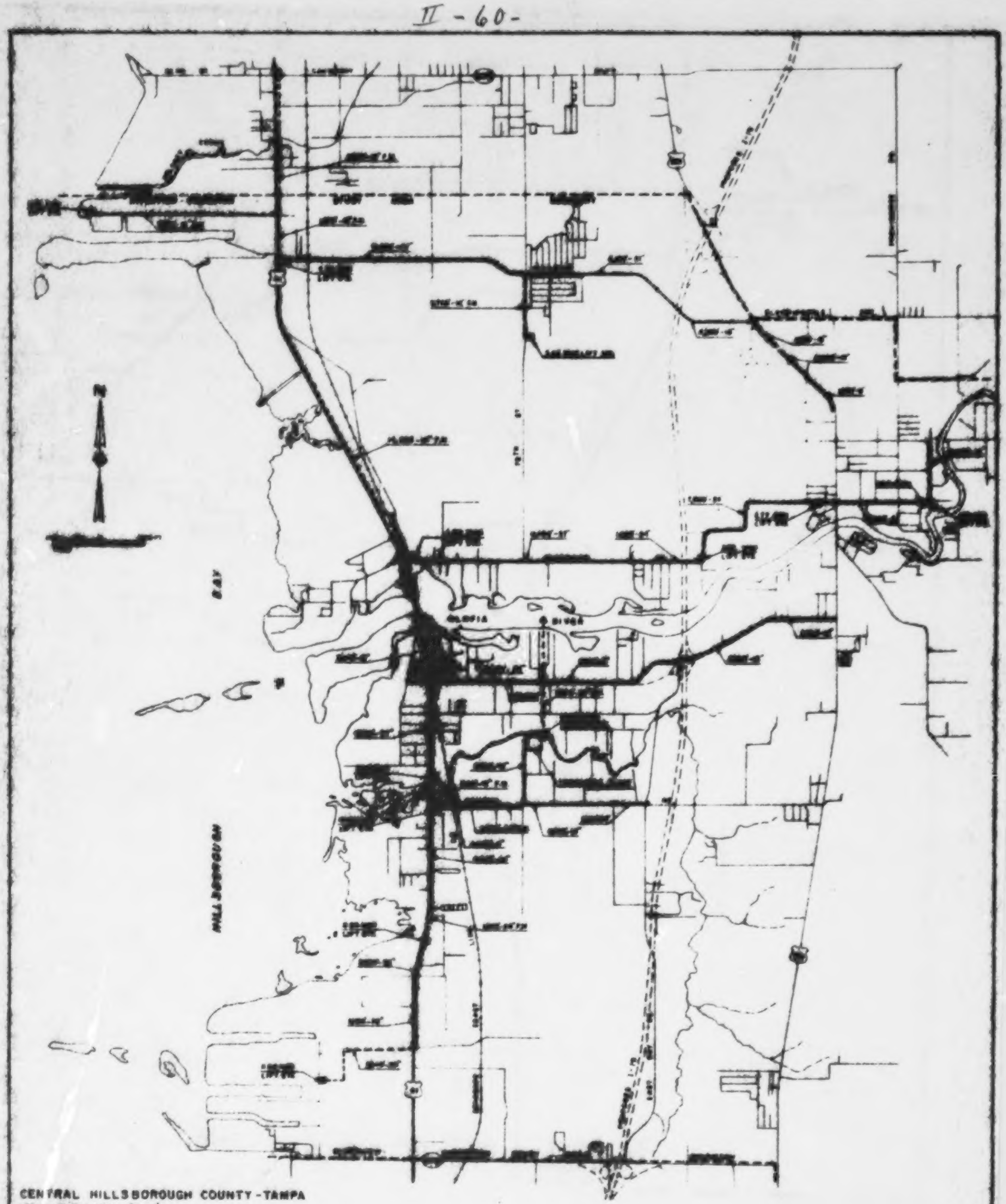
SOURCE :
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

DAMES & MOORE

FIGURE II-41


N
BAY
HILLSBOROUGH
ALAFIA RIVER

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201 FACILITY PLAN
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EPA No. C120634010

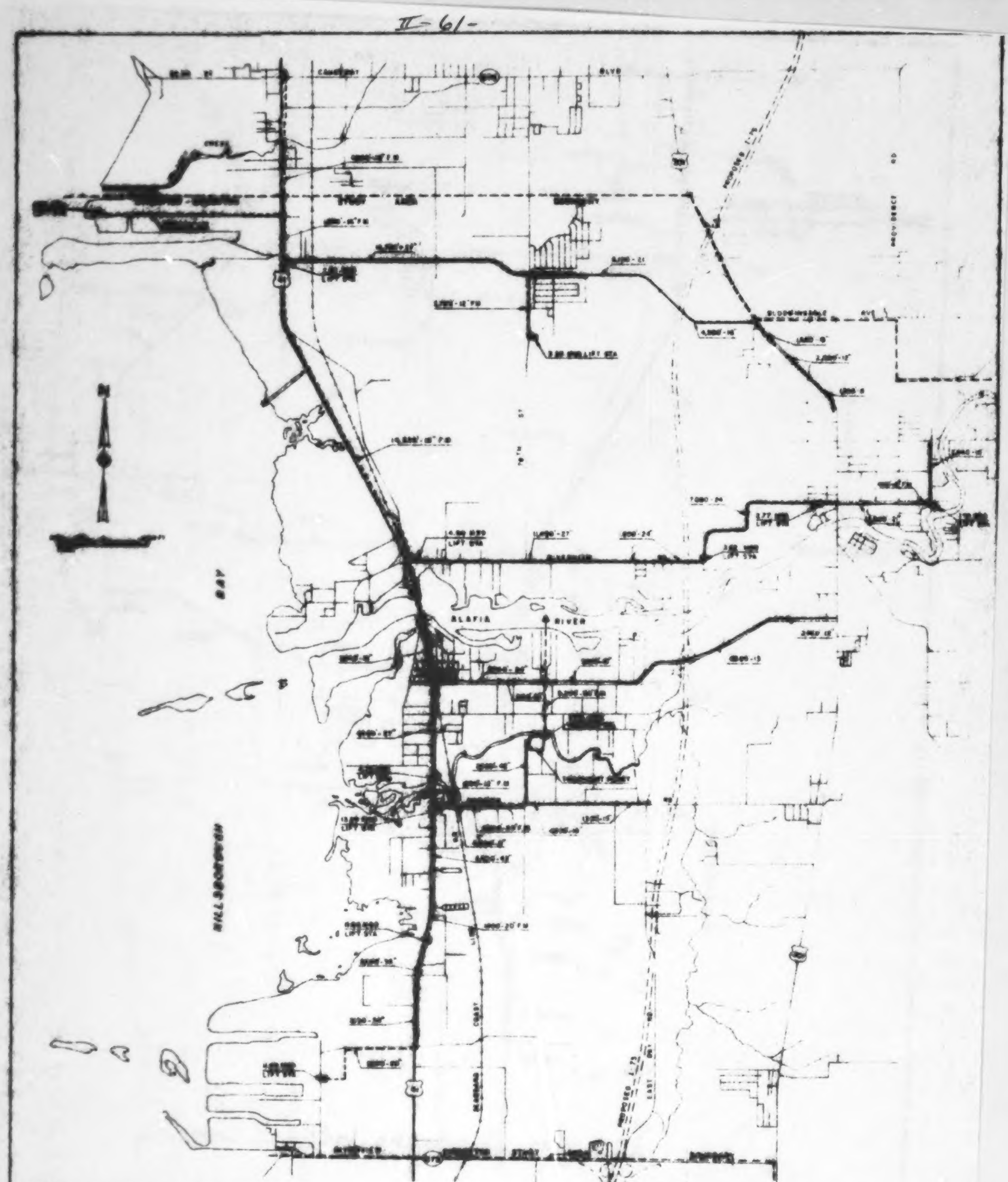
COUNTY ALTERNATIVE [illegible]

9A: [illegible] TO TAMPA

9B: [illegible] TO ALAFIA RIVER

SOURCE:
[illegible]

[illegible]
FIGURE II-42


ALAFIA RIVER
BAY
HILLSBOROUGH
BLOOMINGDALE AVE
PROPOSED I-75
PROVIDENCE RD
N

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201 FACILITY PLAN
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COUNTY ALTERNATIVE RG9

9A: PUMP TO TAMPA

9B: ADVANCE WASTE TREATMENT/DISCHARGE TO ALAFIA RIVER

SOURCE :

SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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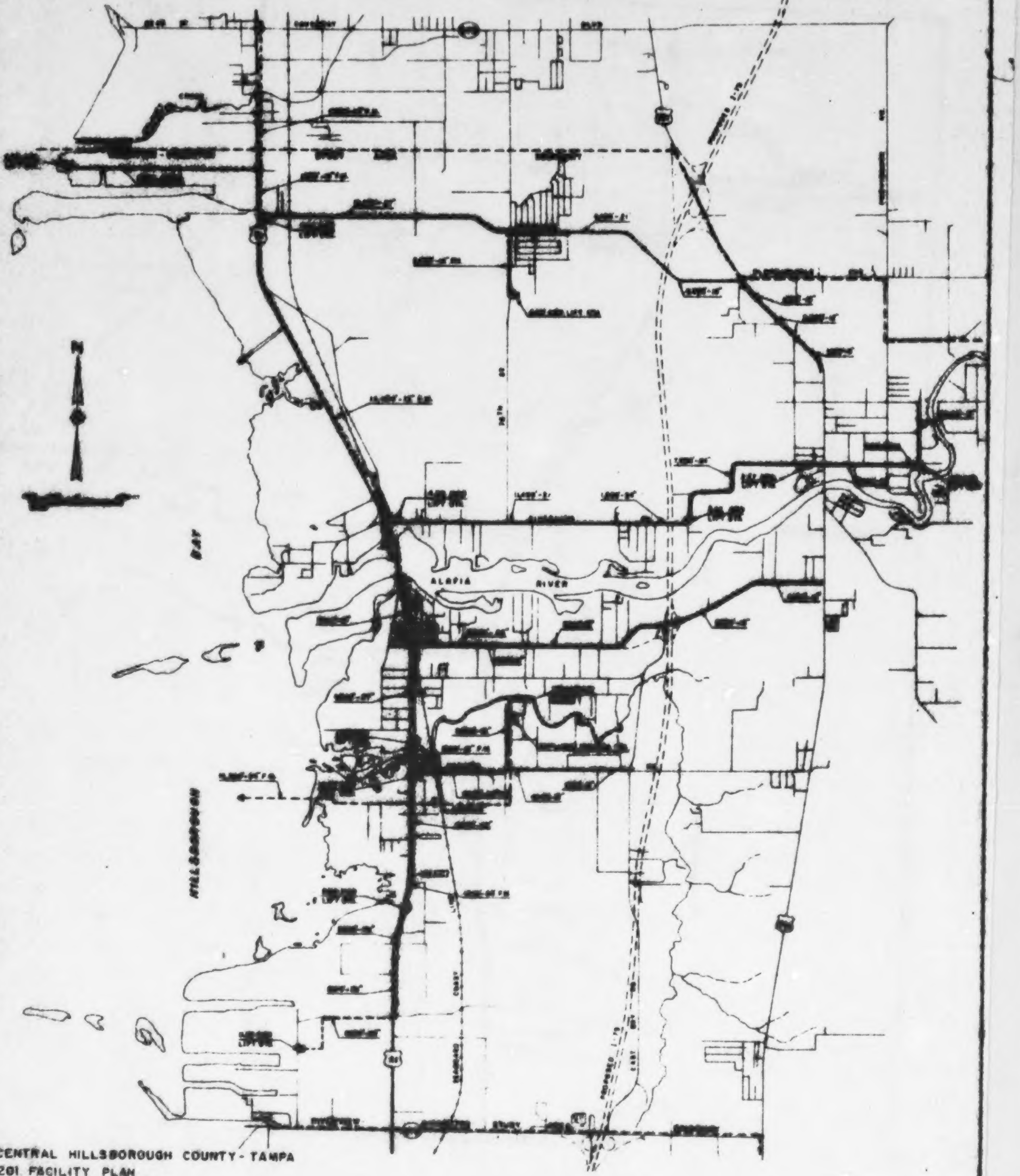
FIGURE II-43

II-62-


ALAFIA RIVER
HILLSBOROUGH BAY
N

CENTRAL HILLSBOROUGH COUNTY - TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. 120634010

GRAVITY ALTERNATIVE R610

9A: PUMP TO TAMPA

9B: ADVANCE WASTE TREATMENT/DISCHARGE TO HILLSBOROUGH BAY

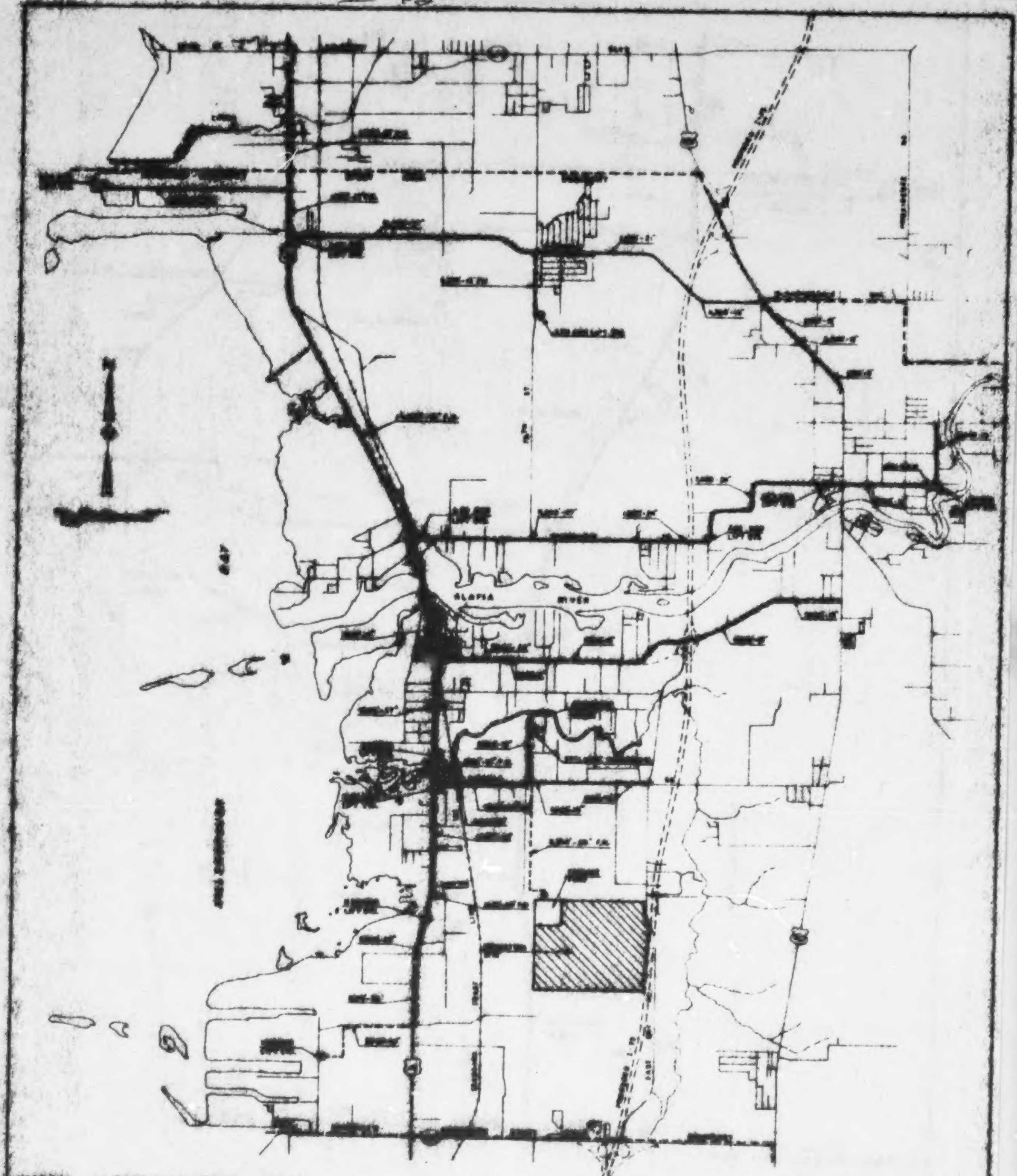
SOURCE :

[illegible]

DAMES & MOORE

FIGURE II-44

II-63-



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EPA No. C120634010

COUNTY ALTERNATIVE [illegible]

5A. PUMP TO TAMPA

5B. [illegible] TREATMENT/SPRAY IRRIGATION

SOURCE :

[illegible]

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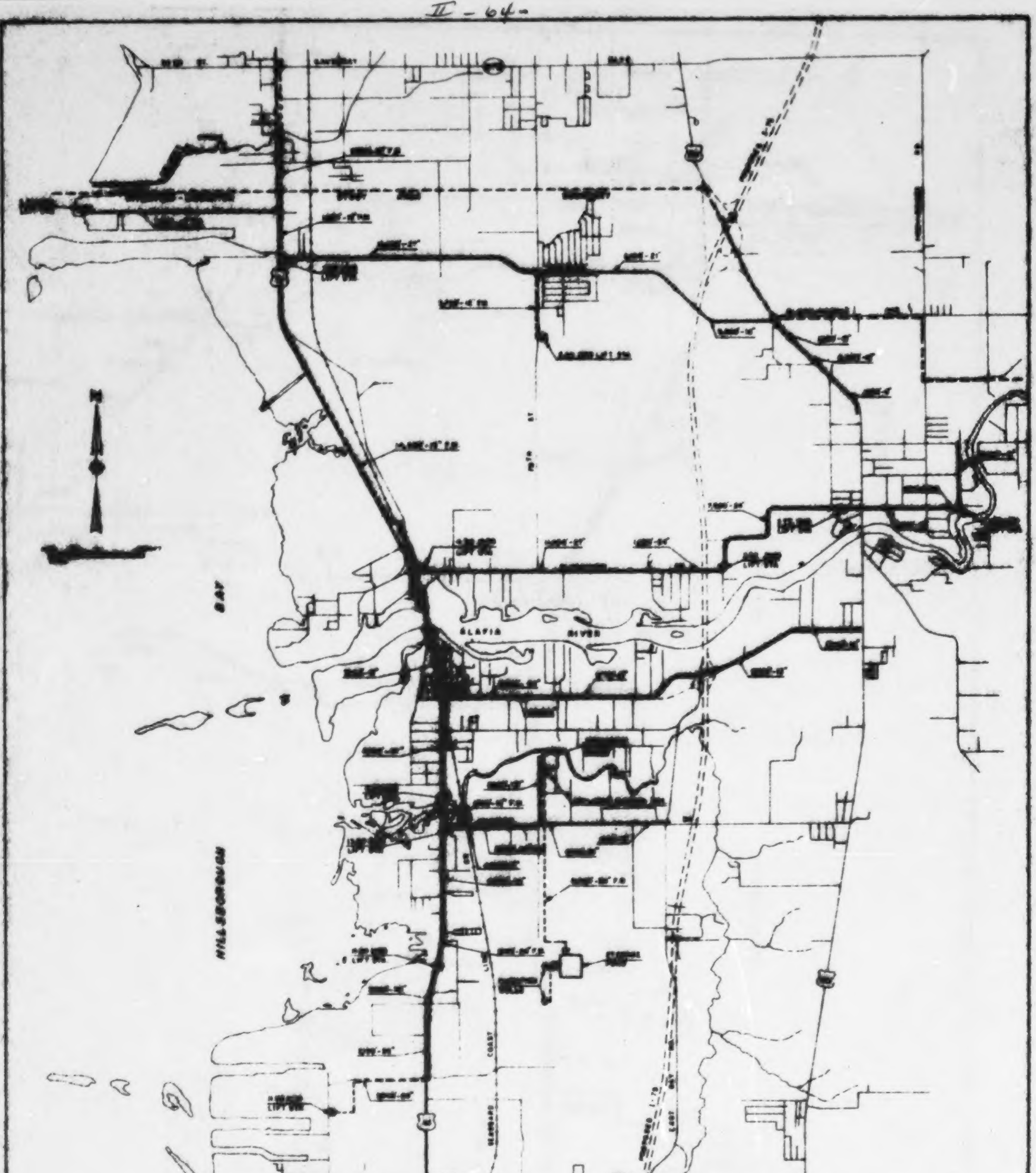
[illegible]

FIGURE II-48

II - 64 -


HILLSBOROUGH
BAY
ALAFIA RIVER
COAST
SEABOARD
RIVERVIEW

CENTRAL HILLSBOROUGH COUNTY
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

COUNTY ALTERNATIVE 5A/B

5A: PUMP TO TAMPA

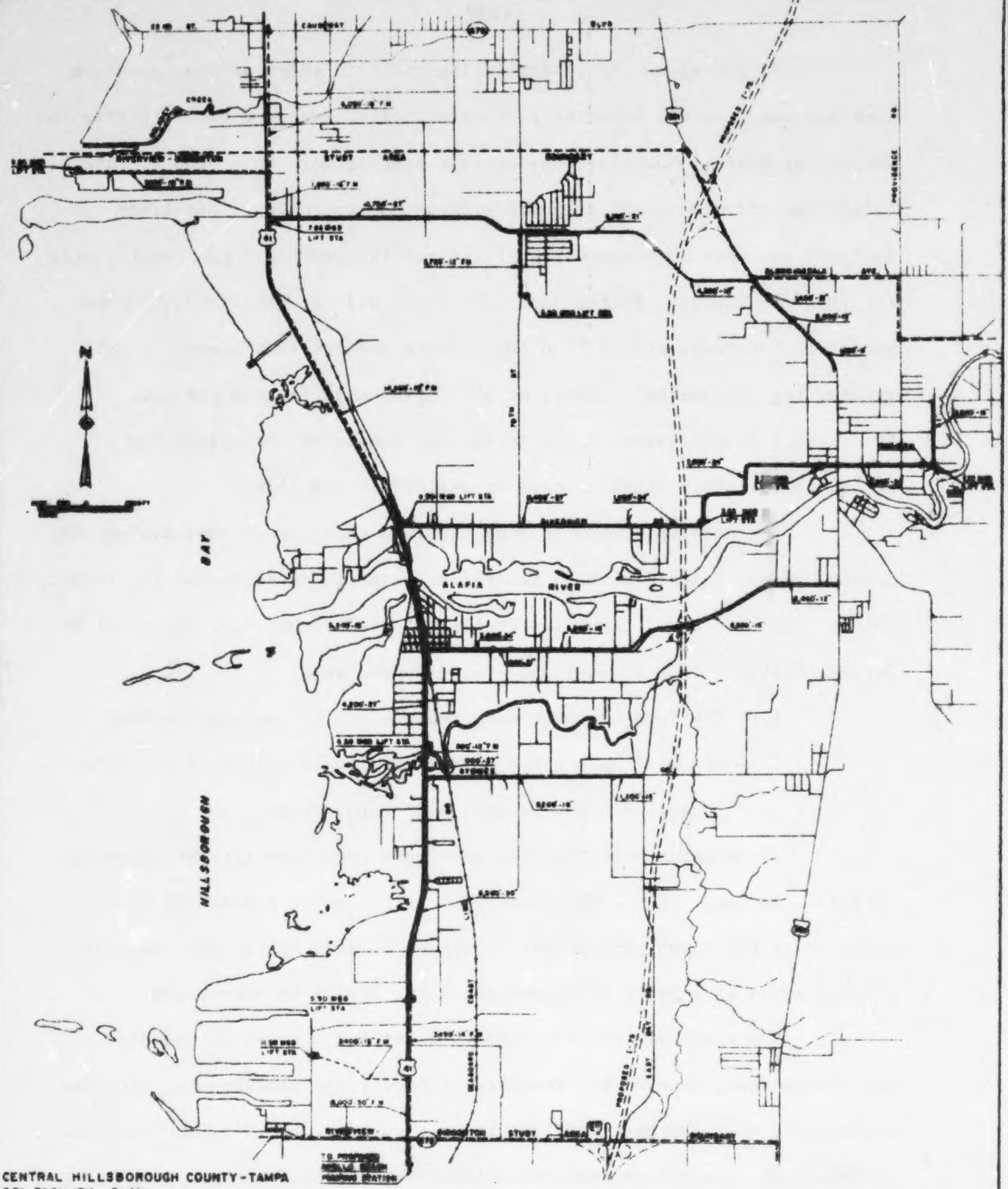
5B: SECONDARY TREATMENT/FILTRATION/DEEP WELL INJECTION

SOURCE:
SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

DAMES & MOORE

FIGURE II - 46

II-65-


ALAFIA RIVER
HILLSBOROUGH
BAY
STUDY AREA
BOUNDARY
RIVERVIEW
GIBSONTON
STUDY AREA BOUNDARY
PROVIDENCE RD
PROPOSED I-75
LIFT STA
TO PROPOSED
APOLLO BEACH
PUMPING STATION

CENTRAL HILLSBOROUGH COUNTY-TAMPA
201 FACILITY PLAN
ENVIRONMENTAL REPORT
EPA No. C120634010

COUNTY ALTERNATIVE RG13

5A: PUMP TO TAMPA

5B: PUMP TO SOUTH COUNTY

SOURCE :

SMITH AND GILLESPIE
GREELEY AND HANSEN
ENGINEERS

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DAMES & MOORE

FIGURE II-47

Financing of the system is important in terms of "who pays the cost and who gets the benefits". Theoretically, everyone benefits from the wastewater system; however, some persons benefit more than others. The collection, treatment and disposal systems considered have pipelines designed for year 2020 wastewater flows and the pumps and treatment plants for year 2000.flows By the year 2000 there will be about 300,000 more people on the sewer system than now. (This assumes that growth is not greater than projected) Parts of the system must be paid for now. Therefore, present users of the system may subsidize the system for future users. Such subsidy is to be avoided if possible.

Furthermore, there is more involved than simply subsidizing the system. Areas which have been sewered may experience increases in property value. The affected landowners receive "windfall benefits". (State of New Jersey, 1975). Thus a developer may gain two ways:

1. His land is worth more because of the sewerage system;
2. His housing becomes more attractively priced (i.e., lower) because the sewers have been subsidized.

These gains mean that the developer runs less risk of financial failure. Further, if the development is at the outer boundaries of the study area, the lower priced housing places housing in the more densely settled areas at a price disadvantage, thus, sprawl is encouraged.

There are six primary ways of financing a sewerage system: connection fees, general tax revenues, property tax assessments, lot size assessment, user charges, and flat rates to users. The City of Tampa and Hillsborough County have used connection fees and user charges to pay for previous facilities. However, the City and County have usually been in a demand-response mode, and past means of financing may not be the best means for financing sewers for the future.

Connection fees are common means of financing sewerage systems (Tabors, 1976). One advantage is that the users of system pay for the system. Thus, in a demand-response mode, connection fees are almost ideal for placing the cost burden of a system upon its users.

The primary disadvantages with connection fees in developing areas are that the municipality is under pressure to connect lines so as to reduce debt service as quickly as possible, and there is a risk in assuming that future hookups to the system will occur to pay the debt service (Urban Systems Research and Engineering, Inc., 1974).

In the first case, use of connection fees does place the burden of payment upon those who use it. Unless the hookups are allowed at a predetermined rate, however the desire to reduce the debt may encourage sprawl, especially if overcapacity exists in the system. In the second case, uncertainties of population projections make financing risky. Without new connections, any bonds already sold cannot be paid off. If the expected population growth does not occur, the municipality may have to look for other financing means, which may require existing users to subsidize the excess capacity.

Population projections beyond five to ten years are uncertain at best. The further into the future such projections are made, the more uncertain the projections. Forty-year projections are of questionable accuracy. Further, projections assume that past trends will continue, of which, there is no guarantee.

In Section I.l, of Technical Reference Document, Volume I, it was concluded that the Planning Area's growth and economy was fueled by migration of persons (mostly retirees) into the Tampa Bay Region. While at this time there is no reason to believe that this trend will change, changes in the economy, cost of living, fuel costs, competing areas, etc., could have an effect. Such uncertainty in population trends makes financing risky.

Financing the system through general tax revenues (primarily property tax revenues) is feasible if the entire population will derive benefits. However, it does mean that everyone (persons using the system and persons not using the system) in the taxing area of the municipality subsidizes future users of the system. Further, the sewerage system must compete with other demands on the general tax revenues. Finally, the use of general tax revenues does not impose marginal costs upon users, and it may not be politically feasible if non-sewered tax payers object to the subsidy.

In the case of property tax assessments, special districts which involve the proposed action would be established. Within these districts residents will pay an additional property tax to finance the system. The existing population (i.e., present property owners) would subsidize the system for future users. However, the property value assessment does provide a mechanism for recovering some of the subsidy - raw land within the service area may be taxed. The value of the raw land will generally increase because of its access to sewerage. Therefore, the raw land can be taxed under the benefit principle of public finance. Further, the raw land's development potential is enhanced, and it is likely that the system will be developed to its capacity (Tabors, 1976).

There are two other problems with using property taxes to finance the system. The first is that sprawl may be encouraged because the desire to reduce debt may encourage local government to allow rapid development which is less dense than originally planned. The second problem, which may be fatal, is that the use of the property tax as a means to finance the system may not be politically feasible. Recently, reactions to property taxes in states have been negative.

There is a relationship between the physical dimensions of house lots and the cost of sewers. Having a user charge or connection fee proportional to lot size may link the amount of debt paid by a user to his use of the system. However, the lot size assessment approach also subsidizes future users.

User charges in the City of Tampa are generally based upon water use. Such a practice has the advantage of tying the use of the system to the amount of debt paid. In a demand-response situation the combination of connection fees and user charges may work well. However, the user charge faces somewhat the same problems as the connection fee. It requires future use of the system as planned for it to work properly and so there is a risk involved in this form of financing.

In some areas flat rates for users have been used. Such practice is typical of small sewerage systems and not particularly applicable to this project. Where the flat rate has been applied, the system subsidizes future users.

Another tool which may be used is phasing construction of the system. Instead of building the entire system at once, the construction of various structures over a period of 10 to 20 years may allow sprawl, reducing financing risk.

These financing options may be used in various combinations in order to maximize the planning goals of the area. The Horizon 2000 Plan provides guidelines which narrow the possible alternatives. The goal is to "develop a financial strategy that is equitable to existing utility customers as well as to new utility customers" (Horizon 2000 Plan, Section "Water and Sewer", pg. 22). To accomplish this objective, the Horizon 2000 Plan favors connection fees for non-linear capital costs plus those linear costs (i.e., pipelines) which benefit all new utility customers, differential connection fees for high cost zones or scattered developments, requiring developers to pay full linear cost for his development, or devising special pricing zones to cover the linear zones.

The Horizon 2000 Plan suggests that the linear cost of extending a utility service not be included within a uniform connection fee, within a uniform monthly utility rate structure, or within a uniform ad valorem tax rate collected from all property owners within the county. The plan also states that the linear cost of extending a utility service shall be paid in total by the developer (who caused the new linear cost) or by the benefited new customers or benefited properties". (Horizon 2000 Plan, Section " Water and Sewer", pg. 25). Monthly utility rates are to be used to cover capital expenditures for replacement of inadequate facilities, technological advancements, and upgrading the system. The reader is referred to the plan for a more detailed discussion.

Three alternatives hypothesized for the construction of this project are:

1. Build the entire system at once.
2. Phase the components of the system such that the pressures for sprawl are reduced, and urban densities in the City of Tampa encouraged.
3. Phase the components of the system such that the financing risks associated with connection fees are reduced.

The first alternative is the most common, particularly where interceptor pipelines are concerned. The other two are less common, but there are places where they have been utilized (Urban Systems Research and Engineering, Incorporated, 1974).

In the first alternative, the pressures to produce suburban sprawl are highest. Because it places a system planned for 40 years into the ground at the beginning of the design life, there is considerable capacity available quickly. Further, the interceptors must be run through areas which are of low density. This phenomena encourages "leapfrogging" which contributes to sprawl. The EPA does not encourage overcapacity in a regional system, and sprawl is not to be encouraged (Federal Register, Wednesday, September 27, 1978, Part III).

The second alternative involves phasing the system such that the densities desired by the Horizon 2000 Plan are met. Thus, those interceptors within the inter-governmental agreement area and in Brandon should be constructed first in order to attract and encourage development in these areas first. Then, as these densities approach the desired levels, sewers may be placed in other areas.

The third alternative uses phasing to reduce the risk in financing. Sewering is not used as a means to influence growth. Instead, the traditional demand-response mode is utilized and other methods are used to control growth. When an area has reached a certain density level, the sewers are built. In this way, financing the system by connection fees is safer.

The major disadvantage of phasing is cost. The first alternative, building the system all at once has a known cost. The costs of financing the other two are unknown. Traditional engineering practice assumes that building one system to last 40 years is cheaper than building two 20-year systems. However, the EPA states that "interceptor pipe sizes...allowable for construction grant funding shall be based on a staging period of 20 years. A larger pipe size corresponding to a longer staging period, not to exceed 40 years may be allowed if the grantee can demonstrate... that the larger pipe would be consistent with projected land use patterns and that the larger pipe would reduce overall (primary plus secondary) environmental impacts." (Federal Register, September 27, 1978, Part IV, Appendix A, f. staging of interceptors, paragraph 2). Further, the EPA will only allow treatment facility staging if the conditions shown in Table II-3 are met.

TABLE II-3

STAGING PERIODS FOR TREATMENT PLANTS

Flow Growth Factor (20 years)	Staging Period (Years)
<1.3	20
1.3 to 1.8	15
>1.8	10

where:

$$\text{Flow Growth Factor} = \frac{\text{Wastewater Flow at End of 20 Years}}{\text{Initial Flow at Time Plant Becomes Operational.}}$$

(Federal Register, September 7, 1978, Part III, Appendix A.)

In all cases under study for sewering, the 1.8 flow growth factor is exceeded. Thus, according to these criteria, the treatment facilities should be staged for ten years.

The critical factor for each of the phasing alternatives is the location of the sewer lines because development pressure will follow these lines. If the sewer lines are built prematurely, the ensuing development could overload the treatment facilities. In such a case, a sewer hook-up moratorium might be necessary, but the solution most likely to be pressed is the expansion of treatment facilities. If the construction of the pipelines is postponed to the most opportune moment, the phasing alternatives become feasible. Further, the co-ordination of interceptor construction and treatment plant construction or expansion could be very powerful in guiding development to the Horizon 2000 Plan.

Table II-4 presents a matrix showing the advantages and disadvantages of various combinations of financing and staging. If system costs are ignored, the financing/staging combinations which should receive highest priority when examining the alternative routing and treatment schemes are construction phasing alternatives and alternatives using connection fees and user charges. These two alternatives, with some modifications, seem best able to correspond to the Horizon 2000 Plan's guidelines. Alternatives using zoning, subdivision regulations, etc., are more effective if applied in specific locations to mitigate an impact rather than as general policy.

II.4 ENVIRONMENTAL COMPARISON OF ALTERNATIVES

II.4.1 No Action

The No Action Alternative must deal with the question of what the shape and growth patterns of the City of Tampa and Hillsborough County will be if the proposed actions are not implemented. This discussion will be based on the following assumptions:

1. The City of Tampa will proceed to completely sewer the areas within the inter-governmental agreement area.

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TABLE II-4

PHASING ALTERNATIVES FOR INTERCEPTORS AND TREATMENT FACILITIES

	INFLEXIBLE	FLEXIBLE	DEMAND-RESPONSE
Financing Alternatives	Phasing Alternative - 1 (System built at one time)	Phasing Alternatives - 2 (System built so as to increase density)	Phasing Alternative - 3 (System built to reduce subsidy and financing risk)
- Connection Fees	. Users pay cost of interceptors . Relatively high risk of financing problems . Sprawl will be encouraged	. Users pay cost of system . Some risk of financing problem . Sprawl is not encouraged, density higher in desired areas . Future cost of system is unknown	. Users pay cost of system . Little risk of financing problems . Sprawl may or may not be encouraged . Future cost of system is unknown
- General Tax Revenues	. Present population subsidizes future development . Financing problems not risky . Sewers must compete with other governmental needs . Sprawl will be strongly encouraged . System obtained at known cost . Political feasibility unknown	. "Present"* population subsidizes future growth . Sprawl is not encouraged, density is higher in desired areas . Financing problems not particularly risky . Future cost of system is unknown . Political feasibility unknown	. "Present"* population subsidizes future development . Little risk of financing problems, but strong competing demands exist . Sprawl may or may not be encouraged . Future cost of system is unknown . Political feasibility unknown
- Property Value Assessments	. Present population subsidizes future development . Some recovery of subsidy is possible . Sprawl is encouraged . System obtained at known cost . Political feasibility is questionable	. "Present"* population subsidizes future development . Some recovery of subsidy possible . Sprawl is not encouraged . Future cost of system is unknown . Political feasibility is questionable	. "Present"* population subsidizes future development . Some recovery of subsidy possible . Sprawl may or may not be encouraged . Future cost of system is unknown . Political feasibility is questionable
- Lot Size Assessment	. Present users subsidize future development . Pressure for rapid devlopment supports suburban sprawl . Amount of debt paid by user tied to use of system . System obtained at known price . Political feasibility is questionable	. "Present"* users subsidize future development . Sprawl is not encouraged . Future cost of system is unknown . Amount of debt paid by user tied to use of system . Political feasibility is questionable	. "Present"* users subsidize future development . Sprawl may or may not be encouraged . Future cost of system is unknown . Amount of debt paid by user tied to use of system . Political feasibility is questionable
- User Charges	. Present users subsidize future development . Amount of debt paid by user tied to use of system . Sprawl will be encouraged . System obtained at known cost . Financing may be risky	. "Present"* users subsidize future users . Amount of debt paid by user tied to use of system . Sprawl will not be encouraged . Future cost of system is unknown . Financing may be risky	. "Present"* users subsidize future users . Amount of debt paid by user tied to use of system . Sprawl may or may not be encouraged . Future cost of system is unknown
- Flat Rates	. Present users subsidize future users . Rate not tied to amount of use by user . Suburban sprawl encouraged . System obtained at known cost	. "Present"* users subsidize future users . Rate not tied to amount of use by user . Suburban sprawl not encouraged . Future cost of system unknown	. "Present"* users subsidize future users . Rate not tied to amount of use by user . Suburban sprawl may or may encourage . Future cost of system unknown

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*"Present" refers to those users of the systems or general population at the time the improvements are initiated.

2. The package plants in Hillsborough County will remain active, and the Brandon Plant will remain functioning within the County.
3. The Hillsborough County area will continue to grow according to projected levels.
4. The Hookers Point Plant will continue to serve the Tampa Service Area as well as those portions of the County Service Area which it presently serves.
5. Financing for relief facilities for the Tampa Service Area will be the burden of local government.

These assumptions provide guidelines for the potential impacts of the No Action Alternative to be explored and compared with other alternatives.

The growth pressures for the study area are expected to continue. However, because of the already existing problems with septic tank disposal, it is likely that a density of four dwellings or less per acre will be strictly enforced. This would have the following impact upon the growth patterns of the study area: First, there will be greater pressure for growth within the inter-governmental agreement area because of the existence of the City of Tampa sewer system. Secondly, growth in the county will be even less dense than it is at the present time and suburban sprawl will be encouraged. The growth directions are likely to be to the north of Tampa along the Nebraska/Florida Avenue corridor; to the west in the Brandon area along, route 60 and the interstate 4 corridor; and, to the south along the U.S. 41 and U.S. 301 corridor. There will, of course, be a certain amount of fill-in between these three major directions, but this will not be a major factor in the growth of the area. These three directions offer transportation to the City of Tampa and, in most of these areas, there is little infra-structure. Therefore, the worst type of strip development will occur.

The major growth of population in Hillsborough County is not expected to change and it is not expected to comply with the Horizon 2000 Plan. Indeed, it is quite likely that areas designated by the plan as rural will undergo suburban development. Those areas in the county designated as urban transition may not be dense enough to qualify for this category. It is more likely it will be suburban in nature. Expansion of this very low density type of development into the county will have the following land use impacts:

a. Flood prone and floodplain areas will be under tremendous pressure to develop and probably will develop. Past history has shown there is little resistance to development in these areas.

b. There will be a rapid development of those areas with soils suitable for development. As a consequence, the area devoted to truck and citrus crops in Hillsborough County will decrease. The loss of these agricultural activities will mean that Hillsborugh County will cease to be a net exporter of agricultural products.

c. The land use patterns projected by the Areawide Water Quality Study may change. The northeastern portion oo the Tampa Service Area and the Planning Area will likely begin to develop. In the Horizon 2000 Plan, this area is slated for preservation and is part of the drainage basin for the Hillsborough River. The river provides Tampa with its water.

Much of the forest land and range land in the U.S. 41, U.S. 301 corridor past Gibsonton and Riverview will also be developed as will much of the crop land and range land identified by the Areawide Water Quality Study.

d. Recreation will suffer. Presently in Hillsborough County hunting and fishing is an important recreational activity. Increasing pollution of the streams and destruction of habitat for game animals will mean that fishermen and hunters will begin to use the surrounding counties - primarily Polk.

These are the primary impacts associated with the sewer system. There are a number of indirect impacts. These are:

a. The suburban sprawl will require that people drive further to gain employment and basic services. This will add to the existing air quality problems.

b. The cost of providing services will be higher than that in a denser settlement pattern.

c. The problem of underutilization of existing facilities within the City of Tampa will increase.

These induced impacts will decrease the city and county municipal governments' ability to control growth and respond to the needs of its citizens.

The No Action Alternative implies an increase in the number of private sanitary systems (septic systems) for which only limited portions of the Planning Area are suitable. Water quality degradation has already occured which can, in part, be associated with existing septic system use. With the exception of a few areas, most notably in the Brandon/Thonotosassa vicinity, expansion of septic system use is likely to increase the potential for serious water-quality degradation problems.

It is conceivable that contamination of ground water will become a serious enough health hazard for the health department to declare a septic tank moratorium. This moratorium probably would not hold for the entire county but only for those areas experiencing contamination problems. Those areas are likely to be Riverview and Gibsonton and, possibly, Brandon where a moritorium would have the effect of driving more people into the City of Tampa. People would also be driven to the east and southeast of the study area further increasing the land use problems in these areas. Of great consequence, however, is the likelihood that other surrounding counties, such as Pinellas, Manatee, and Polk, will have managed to implement sewer systems. Lacking the same problems as Hillsborough County, these counties would become more attractive for population growth and industrial growth.

As a general overall 201 Facilities Plan alternative, the No Action Alternative may result in undesirable impacts for the Planning Area. However, no federal action may be a viable alternative for portions of the overall 201 Facilities Plan.

Within the Tampa Service Area, the second phase of construction of the Northeast Intercepting System will service currently undeveloped areas within the Hillsborough River floodplain and upstream of the City of Tampa's water supply intake. This second phase includes construction of the Davis Road Intercepting Sewer, the Thonotosassa Road Force Main and

Pumping Station, the Orient Road Pumping Station and Section 2 of the Sligh Avenue Intercepting Sewer from 56th Street to the end (Figure II-1).

At the present, no water quality problems currently exist in this area. Construction of Phase II facilities would encourage development in an otherwise undeveloped area and within the Hillsborough River floodplain. Without federal action, development would result in increased septic system usage and represent a potential threat to Tampa's drinking water supply. However, development of this soil can be prevented through the institution of appropriate floodplain ordinances.

Within the County Service Area, viable No Action alternatives occur in the Deltona, Thonotosassa and Brandon Study Areas. The Deltona and Thonotosassa Study Areas are sparsely developed. At the present, no serious water quality problems exist in these areas. In addition, much of the Deltona Study Area lies within the floodplain of the Hillsborough River and its tributaries.

Sewering of the Deltona Study Area would encourage development in a wetlands environment and in an area where water quality problems do not presently exist. The use of Federal funding for these reasons is not within the intent of the law. Even without federal funding, portions of the Deltona Study Area will develop. Because the area is unsuited for the use of septic tanks, it is expected that future development within this area will tie their wastewater system to the City of Tampa's system. Under this arrangement, the developer would probably be required to install the wastewater collection system. In addition, the developer could be required to pay the incremental cost of increasing the treatment capacity at Tampa's Hookers Point facilities.

The installation of wastewater facilities within the Thonotosassa Study Area would also result in the use of Federal funds to encourage development. Portions of the Thonotosassa Study Area are suitable for the use of septic tanks. The projected population growth withn the study area is not expected to create serious water quality problems. Therefore, the No Action alternative is consistent with expending grant funds to cleanup water quality problems rather than promoting development.

Within the Brandon Study Area, a viable No Action alternative is not providing sewer service to areas currently serviced by septic tanks. Much of the Brandon area is suitable for the use of septic tanks. While portions of the area suitable for septic tank coincide with the recharge area for the Floridan Aquifer, no significant water quality problems presently exist. Therefore, the No Action alternative would be consistent with not expending funds for projects where water quality problems don't exist. Monitoring of ground water quality from area wells will identify contamination which might necessitate the need for future sewer service.

II.4.2 Structural Alternatives

A. TAMPA SERVICE AREA: The suburban areas in the Tampa Service Area were considered together for the purposes of population density analysis. This is because all of the service area, with exceptions of a portion of the Northeast Study Area and the Eastern Study Area, are designated urban. The areas not designated urban, such as light industrial, heavy industrial, major public, major public open space or preservation - inland, are classified as urban transition development. Using the Horizon 2000 Plan land use designations for each of the districts in the Tampa Service Area, the dwelling units/gross acre ratio in the Horizon 2000 Plan, and an estimate of the land use for the sewer district, the range of population for each district was calculated. As a result, the maximum population for the Tampa Service Area is 1,100,000 persons. This is considerably higher than the 736,500 persons projected to be in the study area. Therefore, the design population to be used is well within the 300,000 to 1,100,000 range.

A goal of the Horizon 2000 Plan is to increase the City of Tampa's population density. Designing the sewer system to handle 736,500 persons or perhaps even more people is thus compatible with the Plan. The land use designations of urban or urban transition within the service area cannot be met without sanitary sewers. Further, the desire to increase the density of the Tampa Service Area also cannot be accomplished without sewers. An additional benefit is that sewering the Tampa Service Area will make the area more attractive for development than unsewered areas, discouraging suburban sprawl.

The city already has the infrastructure to accommodate growth. Schools, hospitals, and other services all exist within the city. Further, there are employment opportunities.

The Tampa Service Area is urbanizing rapidly. In several places there are many homes which can be placed on the sewer system very soon. The risk associated with using connection fees and user charges to finance the system is very low.

1. Proposed Collection Systems. Collection systems are advantageous since they minimize potential contamination, permit treatment and disposal by appropriate methods, and discourage ineffectual private disposal systems such as septic systems.

   The construction of these collection systems is expected to have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site, but these impacts will be short-term. Odor problems due to construction are not expected. The operational impacts of system with regard to air quality, odor, and noise are expected to be negligible.

During installation of sewer lines, improper operation of dewatering systems and positioning of spoil piles may result in increased suspended solids loadings on nearby water bodies as a result of erosion. In addition, erosion may cause an increase in turbidity and a decrease in light penetration if suitable control practices are not followed.

As stated above, the sewering of undeveloped areas or light density areas may stimulate growth at a faster rate or to a greater degree than anticipated. In areas where high non-point source loadings to adjacent water bodies are already caused by cropland and pasture, development may actually decrease the suspended solids and total nitrogen load. (TBRPC, 1977). However, other non-point pollutant loads may be increased due to the increase in impervious areas which accompany development. Nevertheless, if the control strategies developed in the Areawide Water Quality Management Plan for the Tampa Bay Region are implemented for such development, suspended solids, nutrients, oil and grease and BOD loading are expected to be reduced (TBRPC, 1978).

The following paragraphs discuss site specific impacts for the various Study Areas that comprise the Tampa Service Area. The archeological and historical survey of the collection system routes is included as Appendix A. Those portions of the proposed routes for which further, intensive survey has been recommended are delineated for each system.

a. Northeast Study Area

The soils of the Northeast Study Area are mixed, suitable and unsuitable for use of septic systems. The area is adjacent to and at the head waters of the Tampa reservoir. Although, the potential for mixing of surface and subsurface waters is moderate to high and karst terrain is present, sewers will reduce the potential for ground-water and surface-water contamination from malfunctioning septic systems.

Sensitive aquatic and wetland vegetation occurs in the study area along the Hillsborough River which prompted relocating the intercepting system along the river to the Davis Road route. Disturbed sand hill habitats are present in the area and these habitats will continue to be destroyed as pressures to develop the area (with or without the sewage systems) continue. Development of this area is consistent with the planning concepts in the Horizon 2000 Plan. However, development within the 100-year floodplain of the Hillsborough River and its tributaries should be discouraged.

i. Davis Road Intercepting Sewer - Freshwater forested wetlands are located near the north and south ends of this interceptor. For this reason, construction procedures which will reduce erosion and control sedimentation are necessary.

ii. Sligh Avenue Intercepting Sewer - Construction near the east end of this interceptor could impact the riverine forest along the Hillsborough River and precautions should be taken to reduce erosion and control sediment transport into this habitat. In addition, significant tracts of freshwater marsh occur near the east end of the interceptor and the 43rd Street Pump Station. The proposed construction and expansion of this pump station could result in sedimentation in these marshes.

Much of this interceptor corridor lies in undeveloped areas, some of which are xeric and may support sensitive sandhill communities. There are also several live oak hammocks in this part of the Northeast Study Area.

b. Eastern Study Area

The water quality of the Bypass Canal is severely degraded, probably due to the combination of non-point source runoff, high water table, and malfunctioning septic systems. The area generally has soils unsuitable for septic tank usage.

If development of the area, as projected in the Horizon 2000 plan, is expected to continue, attainment and, maintenance of acceptable water quality will require sewage facilities.

i. Eastern Intercepting System - For the most part, the northern portion of this area is undeveloped. Citrus groves are common, however, and few natural areas are left. The central sections of this study area contain filled or disturbed isolated wetlands, most of which probably are of very low ecological value. In the southern portion, commercial development has largely replaced natural habitat, although scattered wetlands which support stands of Juncus and Typha do occur. Because so small a portion of the study area is in an undisturbed state, no significant impacts are likely to occur as a result of construction.

ii. Southeast Intercepting System - Scattered development occurs throughout portions of this area, particularly along the northern and eastern halves and near Highway 41. Much of the southern portion consists of open pasture and live oak hammocks with scattered residences. Freshwater marshes and forested creeks also occur and should be protected from the impacts of construction. This is particularly important where the proposed Causeway Boulevard Interceptor crosses Delaney Creek.

In eastern portions of this study area there are important estuaries and forested salt-water wetlands which could be significantly affected by construction. However, within the area near the proposed Interceptor and Pump Station the habitats are disturbed and are generally of reduced quality.

c. Central Study Area

i. 131st Avenue Intercepting Sewer East - Except for the northern portion of the service area the soils are generally suitable for septic systems. However, the population density projected, karst terrain and the internal drainage present indicates a need for the development of a wastewater collection system which will reduce the ground-water pollution potential of the area.

Commercial development occupies most of this area and no significant impacts associated with construction and operation of the intercepting system are anticipated.

ii. Sulfur Springs Secondary Intercepting System - Except for low-lying areas along the river, the soils in this area are generally suitable for septic system use. However, the projected population and density of dwelling units indicate that the area must be sewered by the year 2000. At the present time, karst terrain and the internal drainage of the area contribute to the contamination of ground water and the Hillsborough River.

Most of this area is already protected and impacts on the ecosystem should be minor and temporary. However, two protected plant species have been reported in the general area of the proposed Busch Boulevard Interceptor and the habitats of these species should be identified and protected during construction. In addition, construction of the 37th Street Pump Station should utilize procedures which will prevent the transport of sediments into the nearby reservoir.

The archeological report recommends relocation of the Busch Boulevard Secondary Intercepting Sewer along Riverview Drive to a new location along Yukon Drive. In addition, the report recommends intense survey for prehistoric sites along the Yukon Street Intercepting Sewer from 30th Street to 35th Street.

iii. Northwest Secondary Intercepting System - This area is composed of residential developments and citrus groves separated by several large lakes. With adequate restrictions on dewatering activities to prevent sediment transport to nearby lakes, no significant biological impacts are likely to occur along the proposed interceptor.

The growth patterns expected regardless of sewer installation are consistent with the Horizon 2000 plan.

At the present time, only a limited portion of the area is serviced by sewer facilities and some of these are small package plants; one of which is under citation for polluting surface and subsurface waters. The remainder of the area is on individual septic systems.

Karst terrain with its internal drainage and soils association allows co-mingling of surface, shallow aquifer and deep aquifer waters. The installation of the proposed intercepting system is expected to reduce and ultimately eliminate the pollution of surface and ground water from sanitary and septic systems.

The archeological report recommends intensive survey for possible prehistoric sites along the proposed location of the Country Club Drive Secondary Intercepting Sewer from North Boulevard West to Lake Carrol Cemetary.

iv. Kirby Street Secondary Intercepting System - Citrus groves and residential development occupy most of this area, although several large cypress domes occur in the southern portion. No significant biological impacts are likely to occur along the route of the proposed interceptor.

v. University Secondary Intercepting System - Much of this area contains soils that are questionable or unsuitable for septic systems, especially along the northern portion of the area. Further, the population density projected for the year 2000, the Karst terrain and the internal drainage present indicates a need for the further development of wastewater collection systems to reduce the ground-water pollution potential of the area.

There is considerable commercial and residential development in the area and no significant impacts associated with construction and operation of the secondary intercepting system are expected.

d. Interbay Study Area

i. Southern Secondary Intercepting System - Although most of the natural habitats in this area have been eradicated by development or otherwise disturbed by human activities, significant stands of mangrove and large saltwater marshes remain in some sections. These wetlands and Hillsborough Bay should be protected from sedimentation during construction.

Soils are generally not suitable or questionable for use of septic systems.

Development and population densities are consistent with Horizon 2000 Plan projection.

ii. Tampa-West Secondary Intercepting System - No significant ecological impacts are expected to occur from construction in this developed area.

2. Proposed Relief Facilities.

a. Central Study Area

The construction of these facilities is expected to have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site. The operational impacts of this system with regard to air quality and odor are expected to be negligible; however, the pump station will probably be a small noise source which could be perceived as a nuisance by people living in the immediate vicinity.

i. Buffalo Avenue Pump Station and Force Main - This area has been developed and no significant biological impacts are likely from construction of these facilities.

ii. Adalee Avenue Pump Station and 21st Avenue Force Main - This area has been developed and no significant biological impacts are likely from construction of these facilities.

b. Eastern Study Area

(26th Avenue Force Main and 55th Pump Station)

This area has been developed and no significant biological impacts are likely from construction of these facilities.

c. Interbay Study Area

The construction of these relief systems is expected to have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site, but these impacts will be short-term. Odor problems due to construction are not expected. The operational impacts of this system with regard to air quality, odor, and noise are expected to be negligible.

i. North B Street Force Main - This area has been developed and no significant biologic impacts are likely from construction of these facilities.

ii. Leona Street Force Main - Although this area is developed, construction runoff into Gun Branch should be minimized. No other potentially significant biologic impacts should occur from construction of this facility.

iii. Fair Oaks Avenue Secondary Interceptor - This area has been developed and no significant biological impacts should occur from construction of this interceptor.

iv. West River Interceptor - Several large live oaks are in this area, but avoiding these trees and controlling sedimentation in the Hillsborough River should result in no significant biological impact from construction of this interceptor.

3. Treatment Alternatives. The construction of these treatment systems could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts will be intermittent and of relatively short duration, however. Odor problems due to construction are not expected. The operational impact of these systems on the air quality is expected to be negligible, but there will be some operational noise associated with each system as well as the potential for generation of some objectionable odor. The severity of these impacts will depend on the proximity of residents to the noise and odor sources.

a. Secondary Effluent

Secondary effluent is the most economical of the treatment alternatives and methods of effluent disposal such as deep well injection or land application are environmentally acceptable with regard to impacts on ground-water quality.

The relatively high BOD, nutrient load, and suspended solids characteristic of this effluent makes it generally unsuitable for discharge into surface waters, particularly if these waters flow into estuaries with poor flushing rates, such as Hillsborough Bay. The potential impacts on biota in waters that receive secondary-treated effluents include: blooms of nuisance or toxic organisms, such as blue-green algae; low dissolved oxygen; reduced productivity of forage algae, aquatic invertebrates, and ichtyoplankton; and fish kills. The discharge of these effluents into ground water or their use for land application, however, should result in minimal impacts on biota. With adequate removal of pathogens and toxic substances, secondary effluent should be as acceptable as AWT-I or AWT-II effluents.

b. AWT-I Effluent

This effluent comprises the lowest nutrient loads, BOD, and suspended solids of the available treatment alternatives and would result in the least impact on biota in receiving water bodies. However, during periods of low flow or under conditions of other environmental stress, the nutrients added by this effluent could result in shifts in community structure, reduced diversity, and enhancement of nuisance or toxic organisms. The biologic impacts of using this effluent for land application or in ground-water discharge would be very similar to those associated with secondary or AWT-II effluent.

c. AWT-II Effluent

This treatment alternative would have effects on biota similar to those described for AWT-I, above, except that the higher NO_3-N content would increase the potential for deleterious effects on aquatic biota, especially during periods of low flow or other environmental stress. The release of this added NO_3-N into the Hillsborough Bay estuary for extended periods could also produce a gradual shift to organisms that have growth and reproductive rates that are nitrogen-limited, such as some algal species. The biological impacts of using this effluent for land application or ground-water discharge would be very similar to those associated with secondary or AWT-I effluents.

4. Effluent Disposal Alternatives.

a. Land Application (Slow Rate)

Land application of secondary effluent can be designed to be environmentally acceptable and can, in fact, have a positive benefit by cycling wastewater back into the natural system. Through proper site selection and system management, land application treatment and disposal will recharge the groundwater system without seriously degrading ground-water quality. If desired, renovated water can be recovered.

Work is currently in progress which will evaluate the existing City of Tampa Spray Irrigation Site. Completion of these comprehensive, definitive studies is expected in the near future. Preliminary results indicate that although slight water quality degradation has occurred immediately underlying the site, no measurable effects have occurred down-gradient. The on-site problems which have occurred are due to ground-water mounding at points underlain by lower permeability strata. The resultant rise in water table reduces the unsaturated zone in which it is believed most water renovation takes place (Stewart, M. 1979). Problems of this nature probably do not present a serious obstacle.

The construction of this effluent disposal alternative is expected to have no significant impact on air quality. Construction activities will be a source of noise in the immediate vicinity of the construction site. These impacts will be short-term. Odor problems due to construction are not expected. The operational impact of this system on air quality is expected to be negligible. However, there will be some operational noise associated with the system as well as the potential for generation of objectionable odors. The severity of these impacts will depend on the proximity of residents to the noise and odor sources.

b. Surface Water Discharge

i. Hillsborough Bay - The Hillsborough and Old Tampa Bay estuaries are subject to perturbations from both point and non-point sources that can induce changes in water quality. These changes affect biota in several ways, particularly with those effluents that contain nutrients and/or toxic substances.

The potential deleterious effects of effluents released into estuaries in the Planning Area can be of greater severity than in other aquatic ecosystems because of the susceptibility of these estuarine systems to eutrophication and periods of low flow or reduced flushing (Nesbitt, et al., 1974).

The productivity of algae and some sea grasses is a commonly used indicator of nutrient availability. Sea lettuce (Ulva lactuca) has been shown to grow more rapidly in waters that receive sewage effluents and, in the Planning Area, has produced masses of sufficient size to destroy seagrass beds (Guist, et al., 1976). In general, however, there have been few studies to clearly indicate the direct effects of nutrients on growth of seagrasses (Orth, 1977) although nitrogen levels or sediment nutrients are probably limiting for most species (Patriquin, 1972, Mcroy and McMillan, 1977).

Of particular importance in the Planning Area are the periodic blooms of the red tide algae, Gymnodinium breve. The growth and reproduction of this organism has been correlated with iron associated with dissolved organic matter (Doig and Martin, 1974).

The construction of this effluent disposal alternative is expected to have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site, but these impacts will be short-term. Odor problems due to construction are not expected. The operational impacts of this system with regard to air quality, odor, and noise are expected to be negligible.

Several studies have been performed to assess the impacts of various sewage treatment alternatives on the Tampa Bay system. Of primary interest are two studies performed by Dr. Bernard E. Ross and Ms. Paula D. Jenkins (1977, 1978) utilizing the Tampa Bay and Hillsborough Bay computer models developed at the Structures, Materials and Fluids (SMF) Department of the University of South Florida. One report, entitled "Computer Simulation of Nutrients in Tampa Bay, Florida" (Ross, 1978) assesses the impacts of various sewage treatment levels and discharges on the nitrogen and phosphorous concentrations in the Tampa Bay system. The second report assesses the effects of various treatment alternatives at the Hookers Point Sewage Treatment Plant on BOD_5 and dissolved oxygen (DO) concentrations in Hillsborough Bay (Ross, 1977).

The study conducted for Hillsborough Bay (Ross, 1977) utilized the small scale, large extent model of Hillsborough Bay developed by the SMF Department of the University of South Florida to simulate BOD and DO concentrations in the year 2000. The conditions simulated were: one with projected year 2000 industrial and natural sources discharging to Hillsborough Bay and the Hookers Point treatment plant discharging 100 MGD of AWT effluent; and, the other for the same discharges except the Hookers Point treatment plant had no discharge.

The simulations were based on wet season conditions because the worst condition for Hillsborough Bay in terms of BOD and

DO occur during the wet season. The year 2000 simulations included the completed Port of Tampa harbor deepening project, expected land use changes and expected industrial discharges. The results of these simulations are shown in Figure II-48.

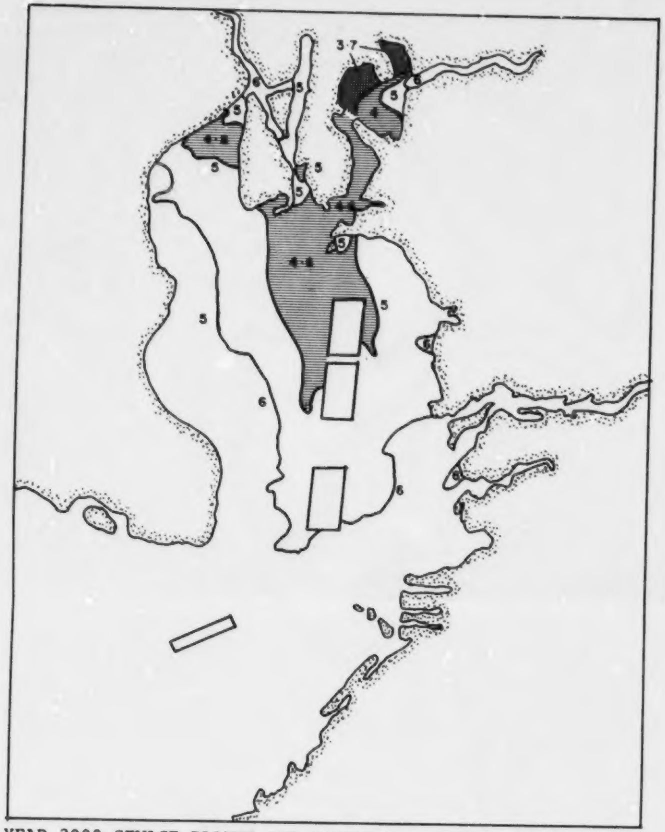
As can be seen from Figure II-48, the primary source of BOD comes from non-point source discharges. The study concluded that:

"The results of the simulations also indicate no measureable effect of the discharge of 100 MGD of AWT quality effluent upon the dissolved oxygen in Hillsborough Bay. The year 2000 wet season runs do dramatically point out the need for a 20 to 30 percent reduction in non-point source discharges, as will hopefully be obtained through the 208 planning process" (Ross, 1977).

The study also concludes that:

"If the non-point source loading for Hillsborough Bay could be reduced by management practices by 30 percent to 89,789 lbs per day (of carbonaceous BOD), the dissolved oxygen levels would rise above 5 mg/l nearly everywhere in the Bay".

A second study, also performed by Dr. Bernard E. Ross and Ms. Paula D. Jenkins, simulated nutrient concentrations in Tampa Bay utilizing the hydraulic and water quality models (Ross, 1978). This study simulated total nitrogen and total phosphorous concentrations in the bay at equilibrium conditions for various treatment and discharge alternatives.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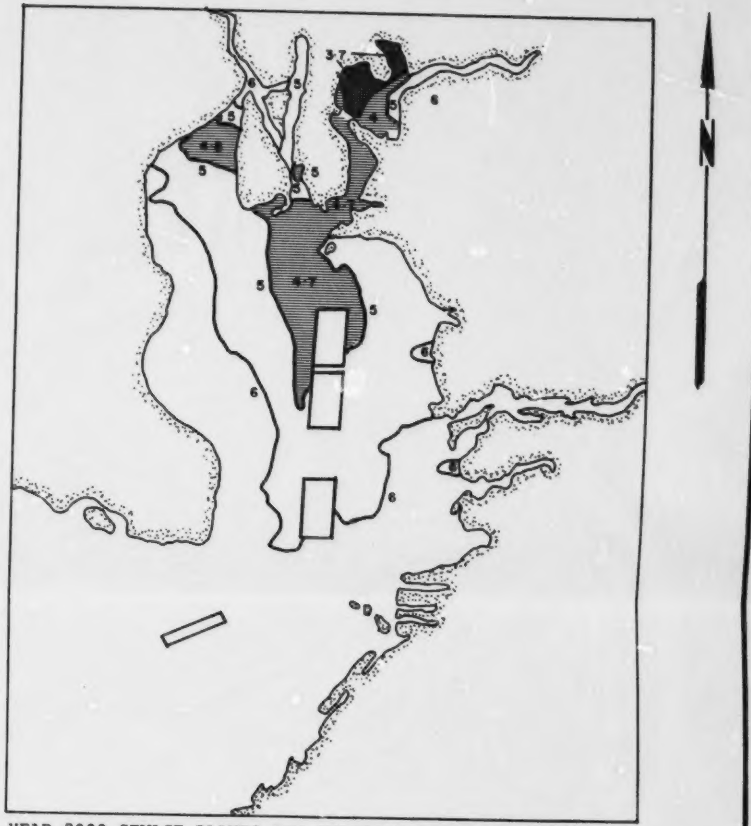
YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 100 mgd AWT.DISSOLVED OXYGEN (mg/l)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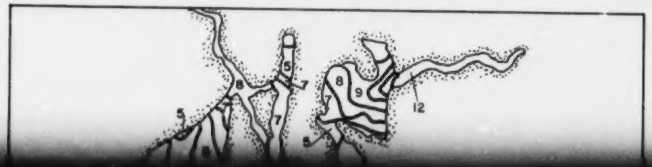
YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 0 mgd .DISSOLVED OXYGEN (mg/l)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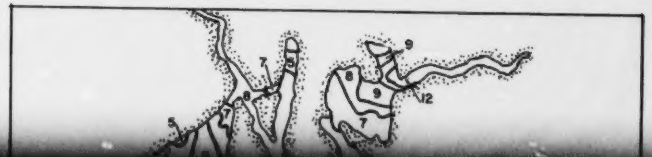
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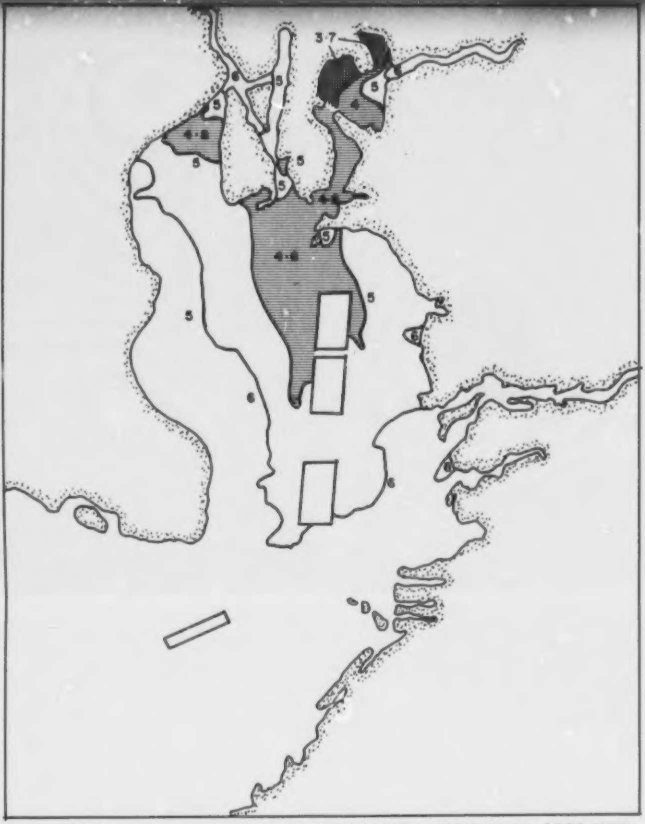
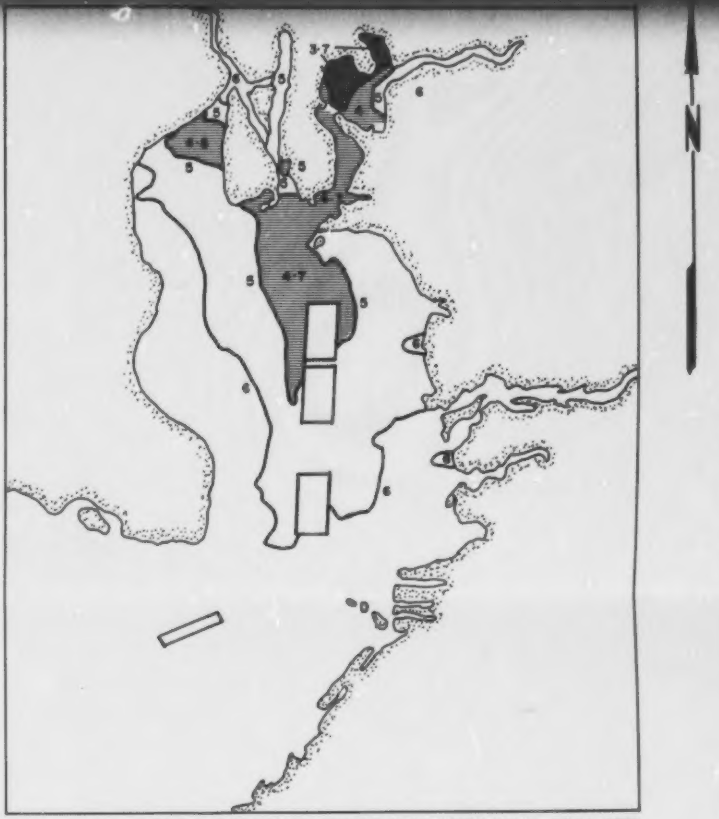


YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 100 mgd AWT.DISSOLVED OXYGEN (mg/l)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4·7
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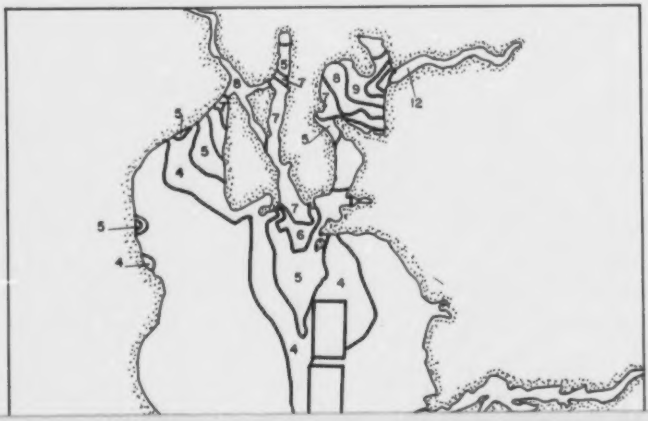
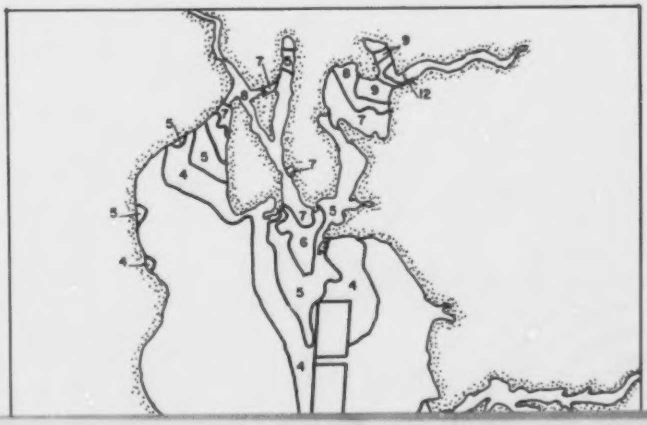
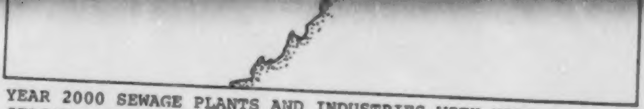
D

YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 0 mgd .DISSOLVED OXYGEN (mg/l)

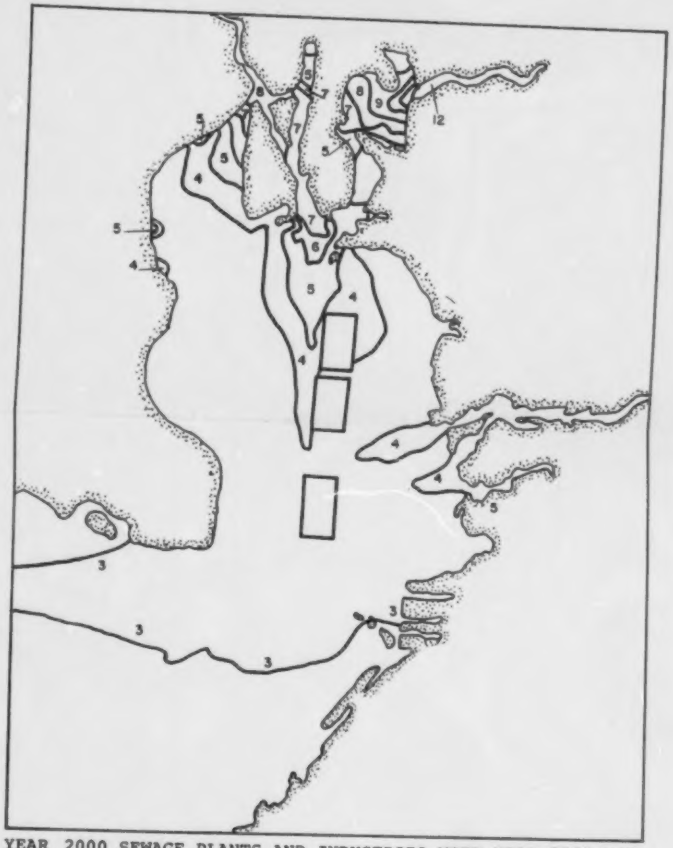




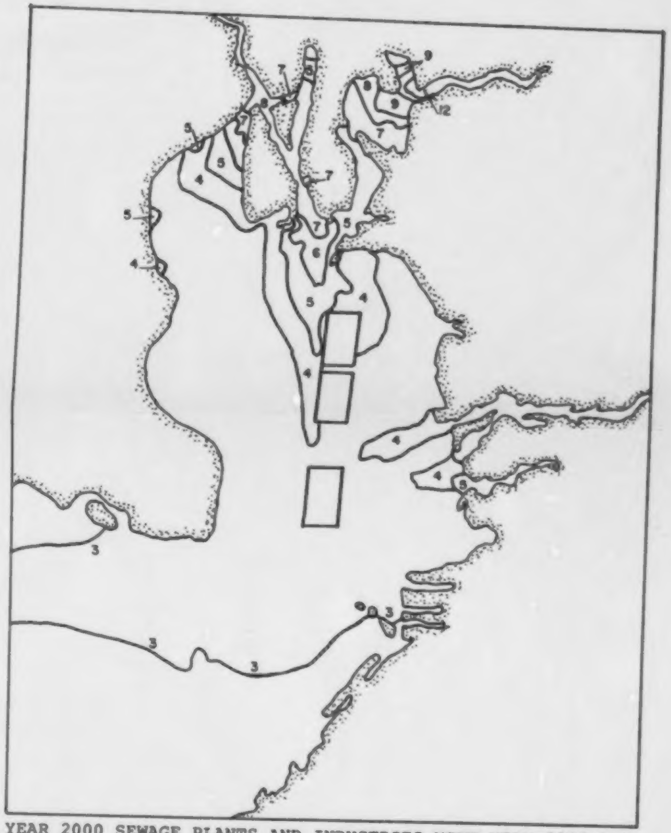
YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 100 mgd AWT.DISSOLVED OXYGEN (mg/l)



YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 0 mgd .DISSOLVED OXYGEN (mg/l)



YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 0 mgd .5-DAY BOD (mg/l)



YEAR 2000 SEWAGE PLANTS AND INDUSTRIES WITH YEAR 2000 WET SEASON AVERAGE NATURAL FLOWS AND TAMPA-HOOKER'S PT. = 100 mgd AWT.5-DAY BOD (mg/l)

LEGEND

▨ D.O. < 5 mg/l

■ D.O. 4 mg/l

— CONTOURS.

SOURCE : ROSS 1977

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ENVIRONMENTAL REPORT
EPA No. C120634010

EFFECTS OF HOOKER'S POINT TREATMENT PLANT ON HILLSBOROUGH BAY

3 0 3
MILES

DAMES & MOORE

FIGURE II-48

Equilibrium conditions occurred when the nutrient distributions reached a point after which they no longer changed appreciably from one tidal cycle to another.

It should be noted that some discrepancies existed during the calibration runs between the total nitrogen concentrations calculated by the computer model and those actually measured in water samples collected from the bay. As stated in the report:

"This may result from the difficulty of making accurate measurements of the total nitrogen throughout the water column, which is what the U.S.F. model calculates" (Ross, 1978).

However, the results produced by the model are felt to be very conservative estimates.

A total of twelve different loading conditions were simulated during this study. For this assessment, only the four conditions that are felt to be most applicable to this report will be discussed. These conditions are:

1. All projected 1978 nutrient loadings, including 41 existing sewage treatment plants and the Hookers Point discharging 45 MGD of AWT effluent.
2. All projected year 2000 nutrient loadings, including three sewage treatment plants discharging AWT effluent and the Hookers Point plant discharging 100 MGD of AWT effluent.
3. All projected year 2000 nutrient loadings including three sewage treatment plants discharging AWT effluent

and the Hookers Point plant discharging 100 MGD of high quality secondary treatment effluent (P = 6 mg/l, N = 10 mg/l).

4. All projected year 2000 non-point source loadings.

Effluent of AWT quality was assumed to have phosphorous (P) concentrations 1 mg/l and nitrogen (N) concentrations of 3 mg/l.

The three additional sewage treatment plants included in condition 2 and 3 above are River Oaks, Sun City, and Palmetto, all of which are located outside of the Tampa-Central Hillsborough 201 Planning Area. The combined wastewater flows for these three plants total only 20.4 MGD. In addition, current plans call for the River Oaks sewage treatment plant to use land spreading/spraying techniques to dispose of its 12 MGD of effluent. These three additional treatment plants are the result of the proposed regionalization of domestic sewage treatment plants as formulated in the "Water Quality Management Plan for the Tampa Bay Basin" (TBRPC, 1978).

The results of the projected 1978 nutrient loadings are used to approximate existing conditions for comparison purposes. These results, however, will not necessarily reflect actual field conditions in 1978 because the projected concentrations are the concentrations when the system is at equilibrium. Due to the poor flushing of Tampa Bay, equilibrium may not be reached for several years after a major change in discharge occurs.

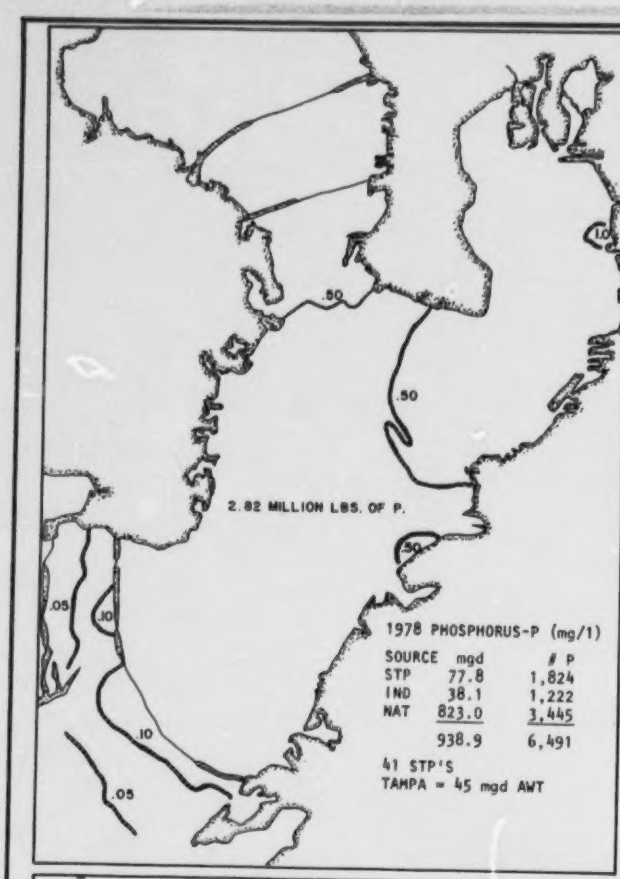
The results of the simulation runs for the four conditions are presented in Figure II-49. Phosphorous concentrations do not vary appreciably except for the condition when the Hookers Point plant is discharging 100 MGD of high quality secondary effluent. For this condition, phosphorous concentrations in Hillsborough Bay increase appreciably, especially in the area of the Hookers Point discharge.

Table II-5 lists the projected phosphorous concentrations at three locations in Hillsborough Bay resulting from the various discharge alternatives. The locations of these stations are shown on Figure II-50.

Nitrogen concentrations do not vary appreciably from 1978 conditions to year 2000 conditions with all treatment plants discharging AWT effluent. The largest increase occurs at the Hooker's Point discharge where the concentration increases from 1.43 mg/l in 1978 to 1.77 mg/l in the year 2000.

Nitrogen concentrations increase substantially in Hillsborough Bay for the condition where the Hookers Point plant discharges 100 MGD of high quality secondary effluent. The nitrogen concentration at the discharge of the Hookers Point treatment plant increases from 1.77 mg/l when all plants are discharging AWT effluent to 3.45 mg/l when Hookers Point is discharging a high-grade secondary effluent.

Nitrogen concentrations in Hillsborough Bay decrease slightly for the condition that considers only non-point sources in the year 2000. The average overall difference in

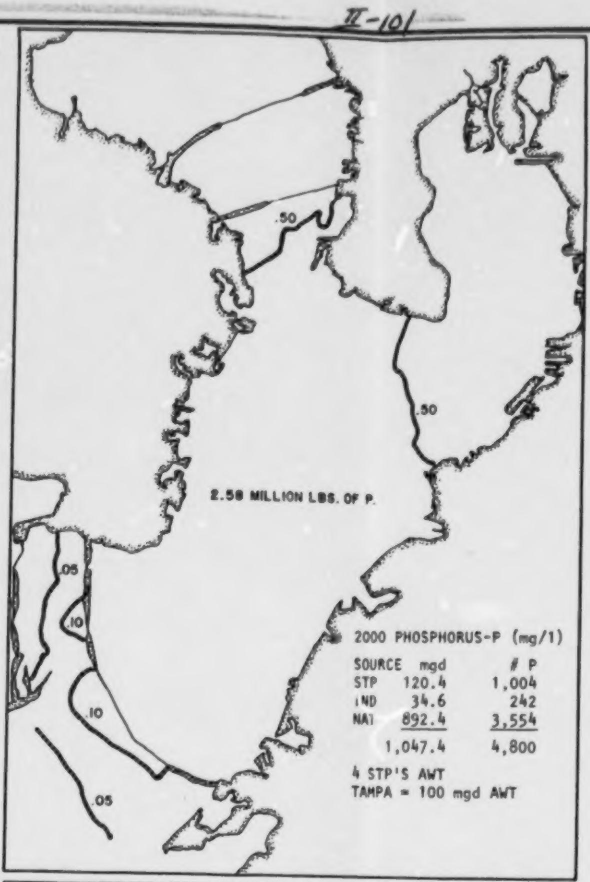


.50
.50
1.0
.50
.05
.10
.10
.05
2.82 MILLION LBS. OF P.

1978 PHOSPHORUS-P (mg/1)

SOURCE	mgd	# P
STP	77.8	1,824
IND	38.1	1,222
NAT	823.0	3,445
	938.9	6,491

41 STP'S
TAMPA = 45 mgd AWT

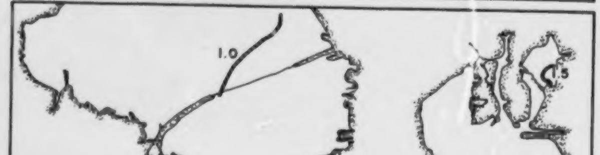


.50
.50
.05
.10
.10
.05
2.58 MILLION LBS. OF P.

2000 PHOSPHORUS-P (mg/1)

SOURCE	mgd	# P
STP	120.4	1,004
IND	34.6	242
NAT	892.4	3,554
	1,047.4	4,800

4 STP'S AWT
TAMPA = 100 mgd AWT

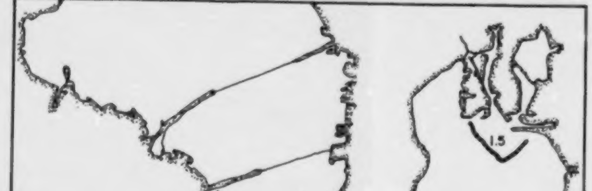


1.0
1.5
1.0
.50
.05
.10
.10
.05
4.37 MILLION LBS OF N.

1978 NITROGEN-N (mg/1)

SOURCE	mgd	# N
STP	77.8	5,940
IND	38.1	752
NAT	823.0	7,634
	938.9	14,326

41 STP'S
TAMPA = 45 mgd AWT



1.5
1.0
.50
.05
.10
.10
.05
.50
1.0
4.00 MILLION LBS OF N.

2000 NITROGEN-N (mg/1)

SOURCE	mgd	# N
STP	120.4	3,012
IND	34.6	534
NAT	892.4	7,790
	1,047.4	11,336

4 STP'S AWT
TAMPA = 100 mgd AWT

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EPA No. C120634010

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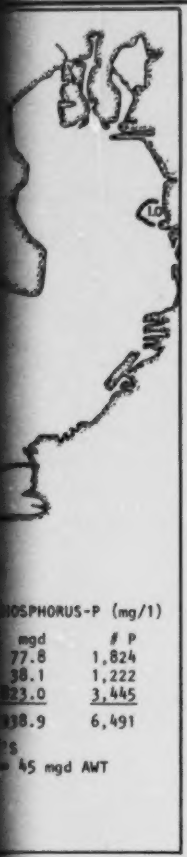
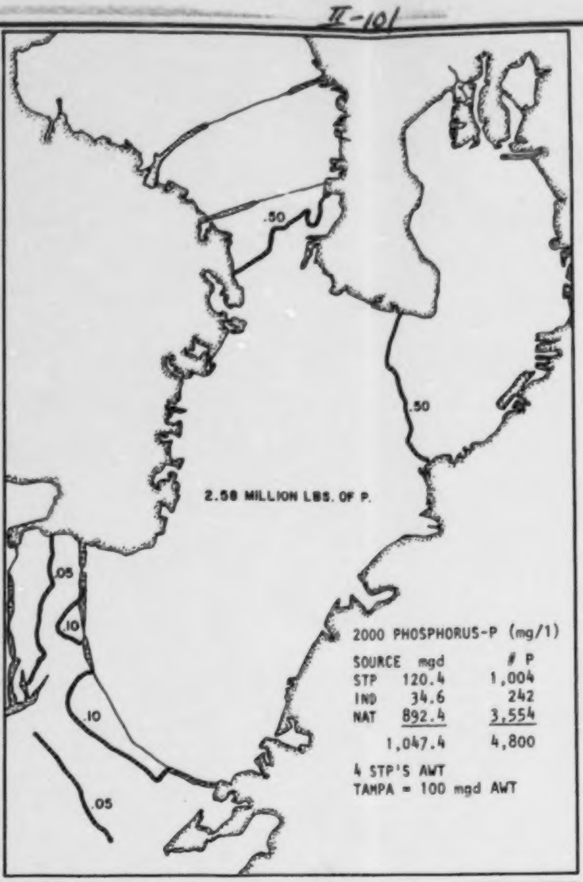
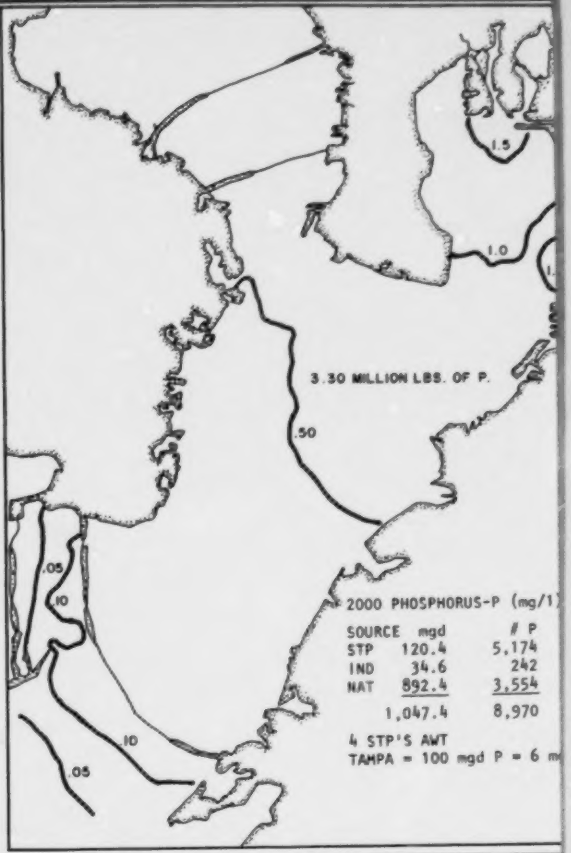
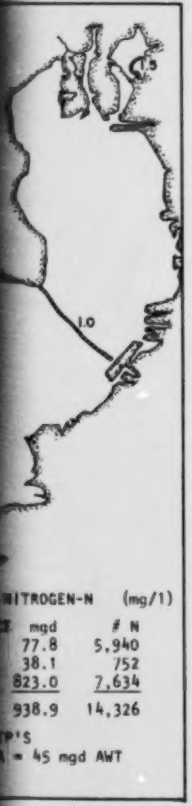
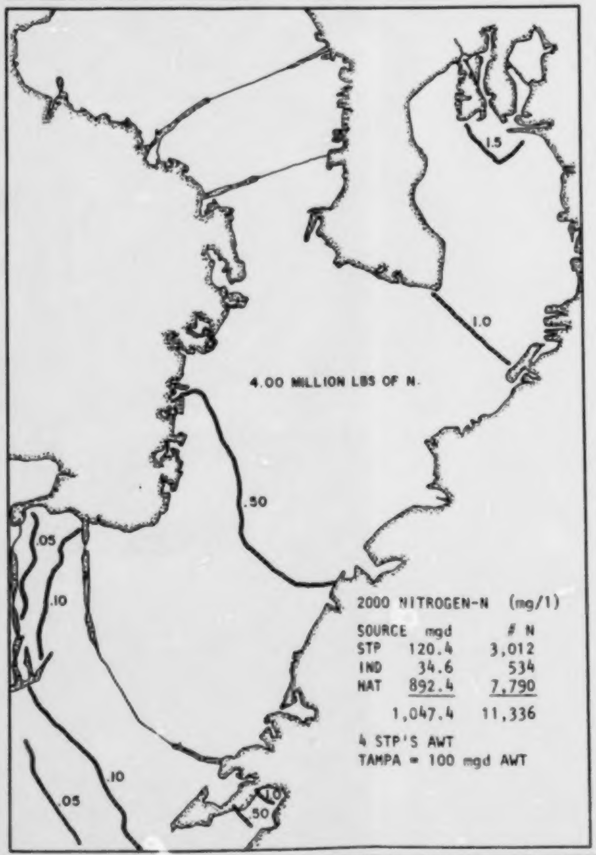
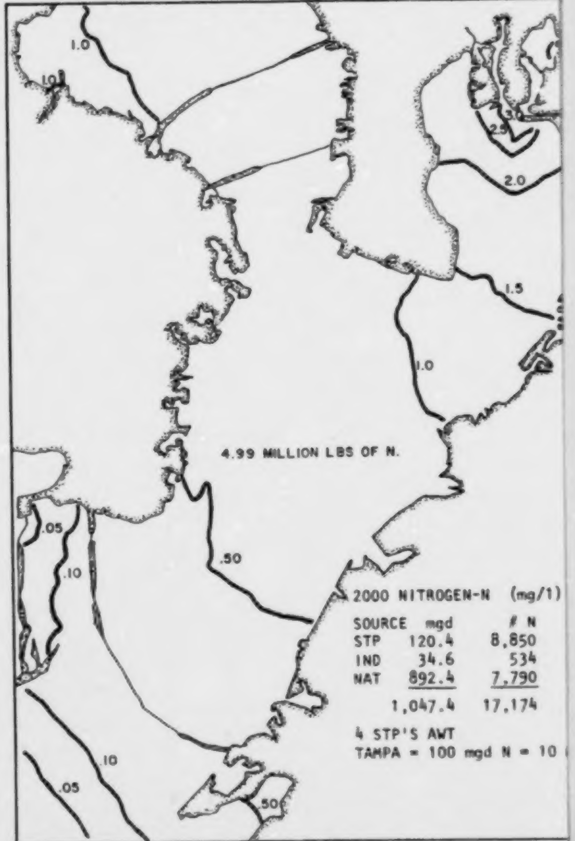

1.0
HOSPHORUS-P (mg/1)
mgd # P
77.8 1,824
38.1 1,222
823.0 3,445
938.9 6,491
'S
= 45 mgd AWT

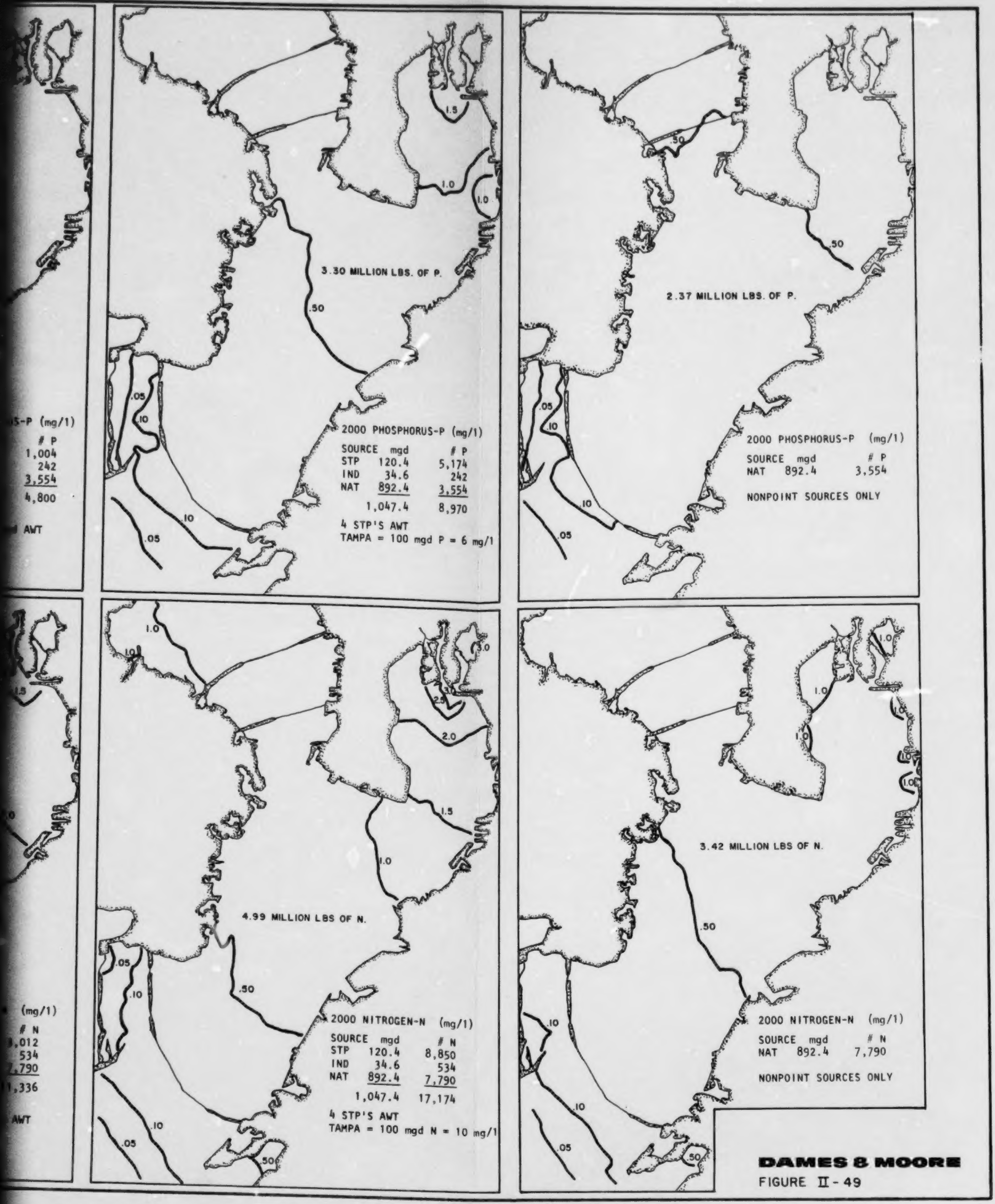

.50
.50
2.58 MILLION LBS. OF P.
.05
.10
.10
.05
2000 PHOSPHORUS-P (mg/1)
SOURCE mgd # P
STP 120.4 1,004
IND 34.6 242
NAT 892.4 3,554
1,047.4 4,800
4 STP'S AWT
TAMPA = 100 mgd AWT


1.5
1.0
3.30 MILLION LBS. OF P.
.50
.05
.10
.10
.05
2000 PHOSPHORUS-P (mg/1)
SOURCE mgd # P
STP 120.4 5,174
IND 34.6 242
NAT 892.4 3,554
1,047.4 8,970
4 STP'S AWT
TAMPA = 100 mgd P = 6 m


1.5
1.0
S
NITROGEN-N (mg/1)
mgd # N
77.8 5,940
38.1 752
823.0 7,634
938.9 14,326
TP'S
= 45 mgd AWT


1.5
1.0
4.00 MILLION LBS OF N.
.50
.05
.10
.10
.05
.10
.50
2000 NITROGEN-N (mg/1)
SOURCE mgd # N
STP 120.4 3,012
IND 34.6 534
NAT 892.4 7,790
1,047.4 11,336
4 STP'S AWT
TAMPA = 100 mgd AWT


1.0
1.0
2.5
2.0
1.5
1.0
4.99 MILLION LBS OF N.
.05
.10
.50
.10
.05
.50
2000 NITROGEN-N (mg/1)
SOURCE mgd # N
STP 120.4 8,850
IND 34.6 534
NAT 892.4 7,790
1,047.4 17,174
4 STP'S AWT
TAMPA = 100 mgd N = 10



S-P (mg/1)
# P
1,004
242
3,554
4,800
d AWT
1.5
1.0
1.0
.50
.05
.10
.10
.05
.05
.10
.10
.05
.50
.50
(mg/1)
# N
,012
534
,790
1,336
AWT
1.0
1.0
2.0
2.0
2.5
2.0
1.5
1.0
.05
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.50
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.50
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1.0
1.0
1.0
.50
.10
.10
.05
.50

3.30 MILLION LBS. OF P.

2000 PHOSPHORUS-P (mg/1)

SOURCE	mgd	# P
STP	120.4	5,174
IND	34.6	242
NAT	892.4	3,554
	1,047.4	8,970

4 STP'S AWT
TAMPA = 100 mgd P = 6 mg/1

2.37 MILLION LBS. OF P.

2000 PHOSPHORUS-P (mg/1)

SOURCE	mgd	# P
NAT	892.4	3,554

NONPOINT SOURCES ONLY

4.99 MILLION LBS OF N.

2000 NITROGEN-N (mg/1)

SOURCE	mgd	# N
STP	120.4	8,850
IND	34.6	534
NAT	892.4	7,790
	1,047.4	17,174

4 STP'S AWT
TAMPA = 100 mgd N = 10 mg/1

3.42 MILLION LBS OF N.

2000 NITROGEN-N (mg/1)

SOURCE	mgd	# N
NAT	892.4	7,790

NONPOINT SOURCES ONLY

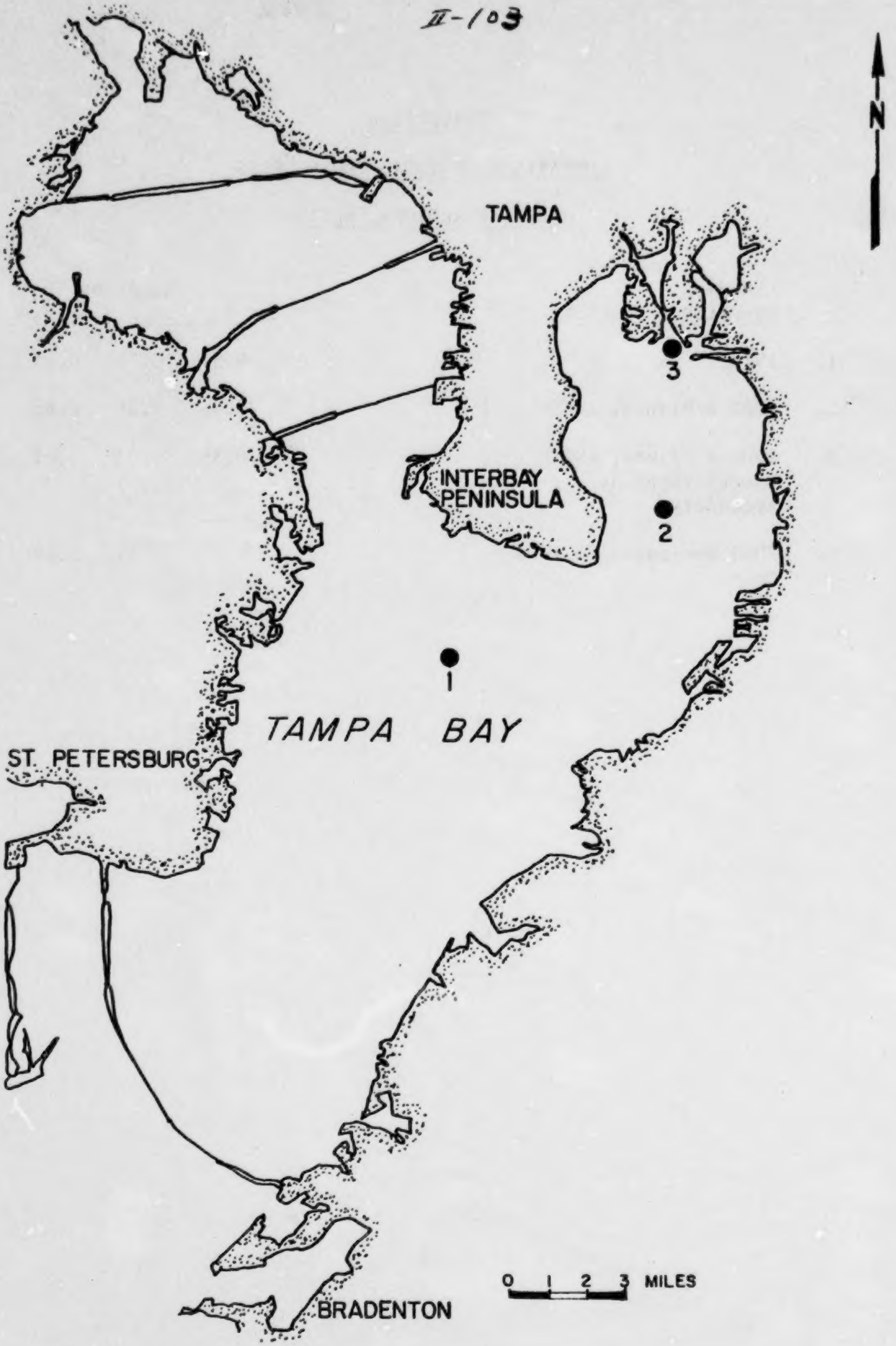
DAMES & MOORE

FIGURE II-49

TABLE II-5

COMPARISON OF TOTAL PHOSPHOROUS CONCENTRATIONS (mg/1)

	Loading Condition	Location 1	Location 2	Location 3
1.	1978	0.51	0.72	0.81
2.	2000 4 Plants, AWT	0.46	0.65	0.85
3.	2000 4 Plants, AWT except Tampa at high secondary	0.58	1.02	2.05
4.	2000 Non-point Sources Only	0.43	0.55	0.59


TAMPA
INTERBAY PENINSULA
TAMPA BAY
ST. PETERSBURG
BRADENTON
1
2
3
N
0 1 2 3 MILES

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LOCATIONS OF PHOSPHORUS COMPARISON POINTS

DAMES & MOORE
FIGURE II-50

phosphorous levels in Hillsborough Bay resulting from elimination of all point discharges is about 0.1 mg/l. The average difference for nitrogen concentrations is about 0.3 mg/l.

These modeling studies indicate that the discharge of 100 MGD of AWT effluent from the Hookers Point treatment plant causes no appreciable difference in the water quality of Hillsborough Bay. In general, the water quality conditions in Hillsborough Bay in the year 2000 will remain the same for the projected non-point source conditions whether or not the Hookers Point treatment plant discharges 100 MGD of AWT effluent.

ii. Gulf Outfall - Any plans for a Gulf outfall for waste effluent disposal should include procedures for reducing impacts on biota in the receiving environment.

It has been suggested that although design of an ocean outfall for discharge of secondary-treated wastewater can be provided to reduce short-term impacts on benthic communities, long-term impacts are not so readily reduced. Among the more important effects of offshore discharges are (1) accumulation of heavy metals and toxic substances in sediments near the outfall, (2) depletion of oxygen, (3) increased productivities (bio-stimulation) resulting from nutrient discharges, and (4) modification of habitat resulting in reduction of species diversity and ecosystem instability. The latter effect could result from increases in some opportunistic species because of an enriched environment (N. C. State University, E. Carolina University, University of North Carolina at Chapel Hill, 1979; CEQ, 1970; Nesbitt, et al 1974).

Marine organisms may be affected by concentrations of toxic wastes well below reported lethal levels. Pesticides and heavy metals are of particular concern and have been linked with fish kills, loss of shellfish, and, through biological concentration, may affect all trophic levels, including terrestrial animals (CEQ, 1970).

Reduction of normal oxygen levels in the marine environment, primarily through the presence of organic substances with high BOD values, results in the rapid loss of sensitive species. In addition, the death of large numbers of organisms results in promotion of nuisance organisms (algae and anaerobic bacteria) capable of reproducing in the oxygen-depleted environment (CEQ, 1970).

Added nutrient loads have long been implicated in stimulating blooms of algae, with subsequent impacts attributed to the decomposition of these plants, such as oxygen depletion and production of odors. Although these impacts are not as likely in open oceans as they are in estuaries, there is increasing evidence that such effects are possible on the continental shelf (CEQ, 1970).

An additional effect of a Gulf outfall can result from chlorine additions to the effluent. Although insufficient field data are available to predict overall impacts, chlorine toxicities in controlled environments are well known. The potential impacts of chlorination include inhibition of plankton growth and reproduction and loss of many plants and animals important to the stability of the marine ecosystem. The construction of this effluent disposal alternative would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

c. Deep Well Injection (DWI)

Deep well injection may be an environmentally acceptable disposal system in the Planning Area. As described in Volume I, there are very low quality ground waters in the Planning Area which may be suitable for injection of wastewater. However, it is not possible, based on the limited data available, to fully evaluate the environmental impacts of this alternative. Clearly, injection should be limited to zones of low quality water with sufficient permeability to accept the desired quantity of effluent. Deep well injection studies would require subsurface exploration and testing designed to locate and define the physical and chemical nature, both vertically and horizontally, of the potential injection zone and surrounding hydrogeologic system. These data would provide the basis for assessment of the environmental impact.

In the Planning Area, there occur two "zones" of relatively poor ground-water quality where deep well injection may be considered. One is within the seawater wedge and/or transition zone in the coastal areas. The second is within the evaporite zone, which lies at depth. However, data indicate that permeability within the evaporite zone is low to very low. This low permeability may seriously inhibit the use of the evaporite zone as an injection zone. It is likely that the major producing zones of the Avon Park limestone (the high permeability dolomite zone) in the nearby coastal area may provide the best opportunity for injection. However, determination of whether these or any other zone underlying the study area is acceptable for injection, would require site specific studies.

It should be noted that although deep well injection may be environmentally acceptable it may not have the positive benefits of recovery of renovated water which is possible with the land application alternative. However, it may be useful in inhibiting seawater intrusion.

The construction of this effluent disposal alternative would have a very small impact on air quality and noise in the immediate vicinity of the construction site. However, any such impacts would be short-term. Odor problems due to construction would not be expected.

The operational impacts of this alternative with regard to air quality and odor would be negligible. However, there will be some operational noise associated with the system. The severity some operational noise associated with the system. The severity of this impact will depend on the proximity of residents to the noise sources.

d. Reuse

Various problems are associated with the reuse of treated effluent. These include fouling problems as well as the possible transmission of pathogens. While these problems can be controlled through shock chlorination or filtration and cleaning, economic costs are high and the health hazard may still exist. The construction of this disposal alternative would be expected to have a small impact on air quality and to create some sources of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this alternative on air quality would probably be negligible although, if cooling towers are used, a potential does exist for pathogen dispersal in the atmosphere. The operational impact with regard to noise would be negligible. However, there could be generation of objectionable odors. The severity of this impact would depend on the proximity of residents to odor sources.

B. COUNTY SERVICE AREA: As was stated in Section I.6, of Volume I, Existing Environment, all stream segments within the Planning Area have been classified as water quality limited. In addition, the Wilson-Grizzle Act requires that all discharges to surface waters in the Tampa Bay Region undergo treatment levels determined by individual wasteload allocation studies.

After selection of a final alternative, a wasteload allocation study will be performed by the Florida Department of Environmental Regulation to determine the minimum level of treatment allowed for the effluent discharge. Although surface discharge of secondary effluent was an alternative which was considered, it is anticipated that all sewage treatment plants discharging to the Alafia River or Hillsborough Bay will be required to provide advanced wastewater treatment (AWT).

1. Deltona Study Area. The majority of Deltona Sewer district 1A is designated rural or major public open space. Based on Horizon 2000 Plan densities, the calculated population range for this area (designated suburban development) is 16,400 to 28,700 persons. The year 2000 design population is 12,000 persons and the year 2020 design population is 22,000 persons. These are well within the design population range.

   Nevertheless, the Deltona alternatives are the least compatible of the county alternatives with the Horizon 2000 Plan. Other than Highway 479, there are no roads, no schools and in addition there are no commercial facilities - in short, there is no infrastructure. The area is under no pressure to develop. In fact, development has been moving in directions other than the Deltona study area. Development has either progressed east along Fowler Avenue or north in the area of Florida and Nebraska Avenues. Unless development trends are altered growth patterns will continue elsewhere.

   There is no employment nearby. The University of South Florida, about four miles away, is the closest major employer. Deltona, however, has been designated as suburban for a substantial area. It is this area in which the proposed sewers would be placed. This is the sole item of compatibility with the Horizon 2000 Plan. Development of the area, even in suburban levels, would encourage suburban sprawl.

Sewer alternative 1A is characterized by an almost total lack of existing development. In the vicinity of the sewer line the only development consists of the Pebble Creek residential area which includes less than 25 homes. The remainder of the area is mainly in rangeland or wetland forested areas in the vicinity of Cypress Creek or along the Hillsborough River.

The Hillsborough River State Park is within the sewer alternative as is the Hillsborough River Game Management Area. The Game Management Area/Camp is about 30 square miles. The Morris Bridge well field, which is associated with the Morris Bridge water treatment plant, is also located within this sewer alternative.

The most notable future development in the area is the Interstate-75 bypass around Tampa. Two subdivisions, Deltona and Trout Creek are planned for future development in this District. Deltona is planned for approximately 3,800 acres and Trout Creek for over 5,000 acres. At present, there is no sign of construction activity in the vicinity of these developments.

Approximately 54 percent of the total sewer alternative is within the 100-year floodplain of either Cypress Creek or the Hillsborough River. Approximately 40 percent of the proposed future development area of Deltona and Trout Creek is within the 100-year floodplain. Much of this floodplain area is in the Deltona development.

Within the sewer district only four percent of the soils have slight limitations for urban development - the remainder have severe limitations. The soils suitable for urban development are located near Flynn Lake south of the Hillsborough River near the Tampa Bypass Canal route. These soils are several miles from the proposed sewer routes and across the Hillsborough River.

Both the Deltona and Trout Creek Development areas have soils which are rated as having severe limitations for urban development due to the area's low, wet nature. Other soils in the area are suitable for truck crops. In the Deltona development the soil suitable for truck crops comprises about 35 percent of the total area while in the Trout Creek development soils of similar suitability comprise about 25 percent of the area.

There are a total of 13 known archeological sites within the sewer alternative. The most significant of these sites are the two which occur near State Route 581 in the proposed future development areas. Deltona is presently undeveloped; further, growth trends have been such that Deltona is not in the path of continued growth. Unless a developer alters these trends, using connection fees and user charges to pay for the system involves a high risk. It is quite likely that development will not occur as planned.

a. Pump 1.39 MGD to Tampa (D-3)

This alternative would include construction of pipelines and two pump stations. The pipelines would be routed along Route 581 and Trout Creek Road rights-of-way and through undeveloped lands to the proposed community of Trout Creek. Displacement of plant cover types by the sewer line will be minimal along both Route 581 and Trout Creek Road. A wide herbaceous right-of-way that is periodically mowed is located along Route 581, while along Trout

Creek Road the sewer line can be routed through the transmission right-of-way that parallels the road. Both routes are early successional, old field communities that can be reestablished within a relatively short period of time after the completion of construction. Impacts on plant communities adjacent to rights-of-way, however, should be avoided.

Riverine forest is present along the Route 581 rights-of-way at both Cypress and Trout Creeks. Remaining vegetation along the two roads is comprised of disturbed pine-flatwoods interspersed with cypress associations. Previous timber harvests, grazing, and clearing of localized parcels of land have altered much of this forest association. Presently, many upland areas in this district have few trees and have a ground cover of either pasture or a dense growth of saw palmetto. Upland oak hammocks dominated by live oak are also apparent along most of Trout Creek Road but grazing pressures within these stands have reduced ground and shrub cover. Cypress associations are common along Route 581 and Trout Creek Road. Damage to vegetation should be avoided during trench excavations, particularly by erosion and sedimentation from dewatering operations that potentially could degrade wetland associations. With appropriate precautions during construction, no adverse impacts are anticipated from sewer line construction along Route 581 or Trout Creek Road.

The remaining segment of the sewer line will connect the main line along Route 581 to the proposed community of Trout Creek. This portion of the pipeline will be placed along a narrow, unimproved dirt road. The area is undeveloped and is similar to that described above for this district.

Investigations for the proposed Trout Creek Community (Lamonte-Shimberg Corporation, 1974) identified three natural areas which include the riverine forest along Trout Creek, narrow riverine forest along Clay Gulley and the cypress ponds and shallow grassy ponds interspersed throughout the area. The proposed pipeline will cross riverine forests along both Trout Creek and Clay Gulley. Cypress ponds and shallow grassy ponds are dispersed throughout the alignment but can be avoided through proper route selection. The alignment should be routed through upland pine flatwoods and pasture lands whenever practical, since these are the most common cover types in the district and least sensitive communities to alteration. Aerial photographs indicate that upland communities within this portion of the Deltona Study Area have been stressed by timber operations and grazing to a greater extent than similar habitats to the west of Route 581. Impacts of clearing, erosion, sedimentation, and bisection of habitats will be greater on this segment of the pipeline than on portions of the line that parallel roadways.

Pump stations are proposed along Route 581 near the intersection of Trout Creek Road and also at the end of the sewer line on Trout Creek Road. Construction of these facilities represents a permanent displacement of approximately one acre for each pumping station. Additionally, construction of a pump station involves disturbance of much larger areas (three to five acres) and these disruptions of habitat require more time for completion than sewer line excavation. Potential impacts from erosion, dewatering, and other construction activities have a high potential for impacting adjacent communities at each of the pump station locations. The present location of the proposed pump station to be constructed on Route 581, near the intersection of Trout Creek Road, is within a cypress association. As noted earlier, cypress communities are one of the most sensitive wetlands types in the Planning Area, particularly to changes in water level. Therefore, this pump station should be moved, if possible, to avoid this wetland association. It could be located to the north within the transmission right-of-way or to the south within a shrubby plant community of saw palmetto, salt bush, and wax myrtle. Either of these locations for this pump station represent regionally-common early successional plant communities and would be less sensitive to construction impacts.

The second pump station is to be located at the end of the pipeline along Trout Creek Road in an upland area of pine flatwoods and oak hammocks. A freshwater wetland is apparently present in the vicinity of this proposed station and these wetlands, like the cypress communities, are extremely sensitive to changes in water levels. The location for this pump station should also be moved to avoid this wetlands area. Adjacent, less sensitive upland areas, preferably pasture, shrub, or pine-flatwood communities should be considered.

In general, the corridor along Route 581 should have no significant impacts on the wildlife of the area. The proposed line along Trout Creek Road is adjacent to a transmission corridor which is maintained by grazing cattle. This large area of contiguous habitat, however, probably results in a higher population density of vertebrates than along other rights-of-way, with a resultant greater potential for impacts from pipeline construction. To the east, this corridor also crosses an area bordered by wetlands and the same increased potential for impacts is present here because wetland habitats are utilized by most of the birds of the area and provide needed breeding grounds for amphibians. This alternative involves the construction of two pumping stations. One pumping station is on Route 581 just south of Trout Creek Road. This pumping station is located in a wetlands area which supports a stand of cypress trees. Thus, not only are the general impacts of pumping station construction present but additional impacts from disturbance of a wetland community must also be considered. Impacts on wildlife from the construction of this pumping station involve loss of habitat for amphibian and bird species. Potentially, the construction of a pumping station in such a wetland community could disturb the water flow patterns of a much larger area than the approximately one acre required for the station and thus cause a loss of substantial habitat. Since amphibian populations serve as a food base for a number of vertebrate groups this disturbance could have far-reaching results. The other pump station would be constructed along Trout Creek Road in a zone of scrub palmetto which appears to be an abandoned pasture. Other than the general impact of pumping station construction, the impact of this station on vertebrates would be minimal.

The effects of the proposed pipelines on aquatic ecosystems will be primarily on Trout, Cypress, and Clay Creek watersheds. These pipelines will intersect two sections of Trout Creek, and one section each of Cypress and Clay Creeks, with impacts associated with dewatering and sediment deposition in these relatively undisturbed aquatic habitats. These slow-moving streams are typical bog or swamp systems, with clear, tannic-stained, acidic water. They are lotic (flowing) ecosystems which support a variety of macrophytic and planktonic plant species (all susceptible to increased turbidity) and macrobenthic invertebrates that probably are primarily herbivores. The construction activities associated with placing pipelines will result in impacts that can be temporary, if erosion control is utilized, or long term, if erosion and dewatering activities occlude or modify stream channels. Increased turbidities and nutrient loads can cause a shift from a diverse phytoplankton community to mostly blue-green algae and a shift in trophic organization from predominately herbivores to detritivores. In addition, a reduction in species diversity at all levels of biological organization is possible. The construction of this collection system would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

An archeological observer is recommended during pipeline excavation from the northern terminus along SR 581 to the western boundary of Section 4, T28S, R19E.

b. Treatment and Disposal of 1.39 MGD Within the Deltona Study Area.

Construction requirements for this alternative are similar to those required for Alternative (a). Alternative (b), however, will sewer a shorter distance of Trout Creek Road and will not require construction of two pump stations. A sewage treatment plant, however, will be built within an undeveloped area to the south of Trout Creek Road.

The treatment plant proposed for this alternative will permanently displace approximately 30 acres of vegetation cover. The proposed location of the treatment plant is within a relatively undisturbed area, with poor access that receives few human visitors. Construction of a facility in this location will cause a greater impact on natural plant communities than construction within disturbed roadside communities. The proposed location appears to include portions of Rock Hammock and field observations indicate that trees characteristic of oak hammocks, such as live oak, occur in the vicinity of the proposed treatment plant. Studies on the adjacent Trout Creek Study Area (Lamonte-Shimberg Corporation, 1974) indicate that oak hammocks occupy less than one percent of the cover type within this region. The treatment plant should be located on more common cover types of the region such as pine-flatwood, shrubby area, or pasture land.

The impacts of this option on wildlife would be similar to (a), above, since this option requires the same pipeline corridors. However, no pump stations are needed and a sewage treatment plant must be constructed along Trout Creek Road. Development of this plant will require approximately 30 acres. The site is scrub palmetto and live oak, which is the most common habitat type of the area. The initial construction impact would potentially disturb a large area but since the habitat type is so common in the area, little permanent effect on the vertebrate populations is anticipated. Thus, pipeline construction and the development of a sewage treatment plant or pumping station, with the exception of the pumping station in wetlands, would have only a temporary effect on local vertebrate populations. The total habitat lost by Alternative (a) above, would be less than two acres while Alternative (b) would permanently remove 30 acres. However, neither alternative would result in a significant reduction in available habitat and would not permanently disrupt any vertebrate population.

Aquatic impacts from Alternative (b) would be identical to (a) except that: (1) a pipeline would not be constructed across Cypress Creek; (2) neither of the two pump stations would be built; and (3) a sewage treatment plant would be constructed south of Trout Creek Road. Although the impacts upon aquatic ecosystems resulting from constructing the treatment plant would not be significant, disposal of treated effluent and sludge could result in important changes in nearby streams. The Hillsborough River would be the most likely recipient of these waters, but since the river is used for human contact activities and as a source of water for the City of Tampa, some other effluent disposal method should be used. In addition, the potential impacts on the plants and animals in and along the Hillsborough River and the potential for bioaccumulation of toxic substances into the food web leading to man, make this aquatic system very undesirable for effluent discharge. No areas suitable for land application are known to exist in the Deltona Study Area. Although there is an abundance of undisturbed wetlands in the area, discharge into these areas would require close monitoring to assure that overflows did not occur.

The construction of this treatment system could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would be intermittent and of relatively short duration. Odor problems due to construction would not be expected. The operational impact of this system on the air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of some objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

The Deltona area is nearly undeveloped, contains substantial wetlands areas, and supports a diverse and abundant vertebrate fauna. Since the construction of pipelines into this area would be an incentive for the development of the Deltona region, permanent instead of temporary habitat destruction would result.

The Deltona area borders the Hillsborough River State Park and a wide variety of vertebrates use the habitat provided. Most of these same species are also found throughout the Deltona region. Increased development and increased human population in this area would greatly decrease its wildlife potential. Although some vertebrates can coexist with human development, most cannot (Engineering-Science, Inc., 1974).

At least eleven threatened and endangered species are known to occur in the Deltona watershed area (U.S. Department of Agriculture, 1979). Development of this area would probably exclude most of these species since most are incompatible with societal developments. Thus, while the direct impacts of pipeline construction are biologically insignificant, the indirect biological impacts from the associated human development in the area could be extremely important.

i. Land Application (Wetlands) (D-1) - The construction of this effluent disposal alternative in the Deltona Study Area would have a very small impact on air quality. Construction activities would be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible. However, there would be some operational noise associated with the system as well as generation of objectionable odors. The severity of these impacts will depend on the proximity of residents to the noise and odor sources.

The discharge of secondary effluent into existing wetlands, such as freshwater swamps and cypress domes, can result in effective removal of BOD, suspended solids, and nutrients. However, the concentration of toxic substances such as heavy metals, may result in effects on vegetation or, more significantly, on the food web in general by bioconcentration (Mudroch, et al., 1979). The volume and rate of discharge of these effluents is generally limited by the retention capacity of the receiving wetlands. During periods of heavy rains, excess release into wetlands could result in overflow of effluent into surrounding habitats with significant impacts on aquatic and terrestrial organisms. In addition, most wetlands vegetation, such as cypress, require dry periods for successful reproduction. The general biological effect of controlled release of treated effluents into wetlands would be an increase in duckweed coverage in these areas with a concomitant reduction in dissolved oxygen and loss of many existing aquatic plant and fish species. However, the frog and snake populations should remain stable and organic decomposition rates of the substrate should not change. In addition, the low dissolved oxygen and the accumulation of organic sediment and clay would act as an efficient microbial filter and no significant health hazards to the human population would be likely (Wharton, et al., 1977).

ii. Deep Well Injection (D-2) - Deep well injection is a poor choice for the Deltona Study Area since, due to its inland location, potential injection zones may lie within zones in which the water quality is relatively good.

It is likely that zones with the requisite poor water quality may not have sufficient permeability for successfull deep well injection.

If chosen, the construction of this effluent disposal alternative would be expected to have a very small impact on air quality. It would be a temporary source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this alternative with regard to air quality and odor would be negligible. However, there would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

2. Thonotosassa Study Area. There are two structural alternatives both of which involve sewering Sewer District 3A. This district is not yet under strong pressure to develop and is primarily designated for suburban development by the Horizon 2000 Plan. This designation results in the following population level (calculated from the densities given in the Horizon 2000 Plan):

District	Population Range		201 Design Population	
	Minimum	Maximum	2000	2020
3A	13,250	35,000	4,700	8,800

Although the 201 design population for 2020 is below the minimum projected population level, when the unsewered population (5,500) is added to District 3A's total population the projected population falls within the design population range. Thus, the population density rating for the Thonotosassa alternatives is acceptable.

The Thonotosassa Study Area is slated for low population density in the Horizon 2000 Plan. Sewer District 3A, the only district in Thonotosassa proposed to be sewered, is predominantly suburban and urban transition in the Horizon 2000 Plan. The small portion in the southwest of the district which is designated urban transition is the area which is near the intersection of U.S. 301 and Interstate 4. In terms of the Horizon 2000 Plan, sewering District 3A is reasonably compatible in terms of designated use. Note, however,that only 60 percent of the 2020 population in District 3A is to be sewered.

At this time, the study area is not under pressure to develop. Even though development is proceeding in the direction of Thonotosassa, there is the Northeast Study Area within the Tampa Service Area yet to develop fully. Unless leap-frogging is encouraged by the construction of a sewer system in District 3A, the Northeast Study Area will develop before District 3A begins to feel strong development pressure. Premature sewering of District 3A will encourage sprawl.

Thonotosassa lacks adequate infrastructure for development. The roads are not as extensive as necessary. There are few services in the area, and there are only two elementary schools in District 3A. Further, employment possibilities close to the study area are few. The nearest major employers are the University of South Florida, the Tampa Industrial Park, and the industrial parks east of Brandon.

In summary, plans to sewer this district are not totally compatible with the Horizon 2000 Plan.

The area proposed for sewering is bounded by Flint Creek on the north and by Interstate-4 on the south. The western boundary is in the vicinity of S.R. 43, while S.R. 579 borders it on the west. The community of Thonotosassa is not within this area.

The total developed area within these boundaries is about 1200 acres. About 800 acres of the area was developed in 1972 with the remaining area developing since then. The increase in acreage between 1972 and 1976 totaled approximately 400 acres or an increase of approximately 50 percent. Developed areas occur mainly along U.S. 301 or along S.R. 579 near its intersection with Interstate-4.

The proposed Tampa Bypass Canal lies within the district east of S.R. 43. The route of the Interstate-75 Bypass also lies within the district. Other significant features within the area include Eureka Springs just west of the proposed Interstate-75 route, north of Interstate-4. The undeveloped areas are presently used for citrus production, improved pasture, or are idle.

Areas along Flint Creek (Cow House Creek) north of U.S. 301 are within the 100-year floodplain. These areas are noted as preservation areas in the Horizon 2000 Plan. This is the most significant floodplain area within the Thonotosassa Study Area.

Existing park acreage within this area totals approximately 56 acres. Population increases (which may be influenced by the sewers) are projected to reach 4,700 by the year 2000 and 8,800 in 2020. These figures indicate that the Study Area's park capacity will be more than sufficient in the year 2000 but insufficient by the year 2020, when the park area available drops to 65 percent of needed capacity. Park acreage available in the various study areas is shown in Table II-7.

Many of the soils in this Study Area only have very slight limitations for urban development. Almost 70 percent of the area has good soil characterstics for urban development. The only soils having severe limitations for urban development occur in the vicinity of Eureka Springs. These soils total about 30 percent of the Study Area and although they have severe limitations for development because of their low, wet nature, they are excellent for truck crops.

The archeological report recommends intensive survey for prehistoric sites along sections of the pipeline routes in the Thonotosassa Study Area. The route along Harney Road in the vicinity of Harney and also along Harney Road between Highway 301 and Williams Road may pose problems. Three sites (Hi 383, Hi 507 and Hi 508) are known in the area. Relocation of the route to the Seaboard Coast Line right-of-way is recommended.

The proposed sewer line along Williams Road, continuing to Pruett Road is also recommended for intensive archeological survey. Site Hi 442 is located in the southeast portion of the area.

Sewering District 3A of the Thonotosassa Area, by using connection fees, involves a higher financial risk than in Brandon or Riverview/Gibsonton. The area is not developing rapidly, and it is likely that it will be several years before development pressure occurs. Because the area is not presently under significant pressure to develop, there is a risk that the area may never develop as anticipated.

a. Pump 0.55 MGD to Tampa

Requirements for this alternative include excavation of trenches for the sewer line and construction of three pump stations. The proposed corridor follows existing road systems the entire length except for a short section of Sligh Avenue that is presently undeveloped. Since the line primarily follows the roadway, minimal impacts would be anticipated since excavation for this collection system would be restricted to the paved surface or the existing rights-of-way. Most areas directly adjacent to road rights-of-way have already been developed and the plant communities removed. Other cover types adjacent to the alignment include citrus groves, pasture, old field and shrubland. Both the old field and shrubland habitats comprise communities that have been altered in the recent past and are neither unique nor sensitive. Much of the old field cover type is located on the bed of the former Seaboard Coastline Railroad. This is a highly disturbed old field community that is an appropriate location for the proposed alignment. Within both citrus groves and pastures the original ground cover has been heavily altered or removed. These pasturelands represent early stages of succession, maintained through grazing, or the native species have been replaced with species better suited to grazing pressures.

Several sensitive cover types are located adjacent to the roadway paralleled by this route. The three areas are small in size and exhibit signs of human disturbance. Two of the sensitive plant associations are freshwater marshes. One area is located near the intersection of State Route 582 and U.S.

Route 301 and the other is located adjacent to Williams Road. The third sensitive area is also located on Williams Road and is a low-forested wetland with a prominence of cypress. Recent off-road clearing activities within larger portions of this wooded wetland have greatly reduced the extent and quality of this wetland system. Precautions shoud be taken during construction, however, to avoid further alterations of these systems by erosion or sedimentation.

Three pump stations would be required under Alternative (a) in which the sewage is pumped to Tampa: Williams Road, Block Dairy Drive, and an undeveloped portion of Sligh Avenue. Approximately three acres would be permanently displaced by these pump stations. The pump stations on Williams Road and Block Dairy Drive would be located along a developed portion of the roads. Plant communities in the vicinity are generally shrub or maintained grasses. These two pump stations should be located within these early successional disturbed communities. The third pump station would be located along the undeveloped midway point of Sligh Road. This area is a low, moist, old field containing plants typical of upland old field (Common ragweed) and moist meadow (Elderberry) communities. This plant community represents an early successional stage common to the region and exhibits signs of disturbance caused by canal excavation and filling. Permanent displacement of this plant community is not considered a significant adverse impact. Moreover, little permanent effect on any vertebrate population is anticipated.

Neither of the two wetlands affected by Alternative (a) are prime wildlife habitat and, while they will support populations of amphibians and birds, the overall wildlife potential for this area is low. The proposed pipeline construction should not permanently disturb any vertebrate population since most of the pipeline runs through developed areas where the habitat potential is already very poor.

The only significant water body crossed by the proposed pipelines for this alternative would be the Tampa Bypass Canal. However, since this canal would be crossed along a bridge, the impacts on aquatic habitats should be minimal.

The construction of the pump station near Sligh Avenue could affect the unnamed creek located near this site that leads to the Tampa Bypass Canal by erosion and dewatering.

The construction of the collection system would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

b. Treat and Dispose Within The Thonotosassa Study Area

Construction impacts for this alternative closely parallel those noted for Alternative (a). The primary difference is that Alternative (b) includes the addition of a treatment plant on Sligh Road instead of a pump station. This treatment plant would displace approximately 30 acres of predominantly low, moist, old field previously described under Alternative (a).

While this permanent displacement of 30 acres of old field represents a greater ecological loss than the one acre displaced under Alternative (a), the impact of this loss is considered minimal because of the disturbed condition of this early successional community.

The impacts of Alternative (b) on vertebrate populations in the area would be the same as those described for Alternative (a) except at the proposed treatment plant location which is one of the few remaining areas of undisturbed wildlife habitat in this sewer district. Some of the largest remaining forested areas occur here. There is a small drainage canal which bisects this area and the potential impacts on vertebrate populations at this site could be severe. Since the area is fairly isolated, this pasture and meadow is probably used by many amphibians and birds. Removal of 30 acres of habitat and the accompanying filling of the area could eliminate vertebrate populations.

The secondary impacts of sewering the Thonotosassa area are not considered severe. Development is rapidly proceeding in this area, and in most of the area, natural habitat is already disturbed. These pipelines may ultimately increase the density of human occupation but the absence of sewers does not appear to be decreasing the rate of development of the area. Thus, no potentially severe secondary impacts directly relating to the construction of sewer lines are anticipated.

The construction of the treatment system could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would be intermittent and of relatively short duration, however. Odor problems due to construction would not be expected. The operational impact of this system on the air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of some objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

i. Land Application (Slow Rate) (T-1) - Much of the land surface of the Thonotosassa Study Area is covered by soils which are suitable for slow rate land application treatment and disposal, including primarily the Lakeland-Arredondo, Blanton-Leon, and Leon-Plume Associations. These soils are generally of relatively high permeability and low available water capacity which is desirable in terms of the soil's ability to accept quantities of effluent, but may be some cause for concern relative to potential for groundwater contamination. In addition, in this area the Floridan aquifer confining bed is moderately leaky and somewhat thin. However, a satisfactory land application treatment system can probably be operated in the Thonotosassa Area despite these hydrologic problems. Its design would necessarily be dependent on site specific and system specific parameters.

The construction of this effluent disposal alternative would have a very small impact on air quality. Construction activities would be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible but there would be some operational noise associated with the system as well as the potential for generation of objectionable odors. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

ii. Deep Well Injection (T-2) - The inland location of the Thonotosassa Study Area makes it a less likely candidate for disposal by deep well injection. The likely injection zone in this area would be in the deep evaporite zone. As mentioned earlier, this zone is of low permeability. However, the effluent quantity in the Thonotosassa Study Areas is relatively small (.55 MGD). Thus, this alternative may be operational. The construction of this effluent disposal method would have a very small impact on air quality and would be a source of noise in the immediate vicinity of the construction site. However, these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this alternative with regard to air quality and odor would be expected to be negligible. However, there would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

3. Brandon Study Area. There are six structural alternatives proposed for Brandon in addition to the "No Action" alternative. However, from a population density standpoint the six structural alternatives are similar: all include Sewer Districts 4A, 4B, and 4D. Thus, the design population density does not change. The question, then, is whether the design populations for years 2000 and 2020 are within the density category populations outlined in the Horizon 2000 Plan. Using the Horizon 2000 Plan, the range of population for each district was calculated. Calculations considered land use designations for each of the districts in the Brandon Study Area and the dwelling units/gross acre ratio in the plan with an estimate of the acreages of the land use for the sewer district. These ranges are shown in Table II-6.

TABLE II-6

District	Population Range		201 Design Population	
	Minimum[1]	Maximum[2]	2000	2020
4A	48,300	235,500	12,500	21,000
4B	54,100	124,700	20,000	29,700
4D	28,600	92,200	19,800	26,600

Using a density range quite likely overstates the actual population which would locate in an area because the use of gross acreage does

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Table II-6 shows that the minimum population from the land use designations exceed the 201 design populations for 2020.

[1] Based upon lower density limits of land use designation

[2] Based upon upper density limits of land use designation.

not compensate for land which may be unsuitable for development. For example, there is an area in the southern part of District 4A which is low, wet, and probably unsuitable for housing. If the area were 20 percent of District 4A, the range predicted in Table II-6 from 48,300 -235,500 would shift to 38,640 - 188,400. Then, the 2020 design population for the 201 plan is well within the range for District 4A. There is, then, a very wide latitude allowed by the Horizon 2000 Plan density guidelines.

The compatibility of sewering Districts 4A, 4B and 4D with the Horizon 2000 Plan is high. These districts, particularly 4A, 4B and the western portion of 4D, are in one of the growth corridors eastward from Tampa and are under heavy pressure to develop.

Brandon has experienced rapid growth in recent years and has been identified by the Horizon 2000 Plan as an area for urban development. The Horizon 2000 Plan land use designations indicate that District 4A includes a considerable amount of light industrial land (about 25 percent of the district) as well as urban land (about 15 percent). District 4B has less dense designations (i.e. about 70 percent urban transition and 20 percent urban). The decreasing density eastward from Tampa is compatible with the Horizon 2000 Plan's concept of modified growth.

The Brandon study area has infrastructure available. However, because the area has grown rapidly, some services (for example, schools) are overloaded. Nevertheless, road systems, employment, shopping areas, and medical services are already present and since this infrastructure is already available, the basic problem is to handle projected increases in population.

Suburban sprawl is already occurring in the Brandon study area. The sewering of Districts 4A, 4B and 4D may encourage growth which will increase the area's density. In Brandon's case, sewering may be one of the remedies for sprawl.

Based upon these factors, the sewering of Districts 4A, 4B and 4D is expected to be compatible with the Horizon 2000 Plan.

The area proposed for sewering in District 4A is bordered on the north by Interstate-4 and extends southward about one mile below S.R. 676. The area's eastern border is just west of Brandon while the western boundary is formed by U.S. 301. Existing urban development of a residential or small commercial nature is found mainly in the northern portion of the area near the intersection of U.S. 301 and Interstate-4, along S.R. 600, along S.R.60 west of Brandon and near Woodbury Lake. Total developed area in 1976 was approximately 1830 acres. Approximately 1,480 of those acres have been developed since 1972. Thus, this area has grown rapidly in recent years.

The undeveloped area in this region has remained in either citrus groves or improved pasture. The citrus groves appear under pressure for residential development since most of the homes in the area are built in what were originally citrus groves. The remaining groves are small and isolated by residential development.

The areas of improved pasture, mainly in the southwestern portion of the area north and south of S.R. 60 along U.S. 301, have had very little industrial development due to the soil's low, wet characteristics and the fact that much of the area is planned for industrial park use. At present, however, very little of the area has been utilized as such. The proposed route of Interstate-75 lies just east of this area.

District 4B is one of the most extensively developed areas of the Brandon Study Area. Total developed area is approximately 2900 acres. Development in 1972 totaled 1000 acres. The increase in development between 1972 and 1976 was approximately 194 percent which indicates the speed of growth in the area.

Development is mainly concentrated north and south of the community of Brandon along the center of the proposed sewer area. Areas which have not been developed are mainly in improved pasture or citrus groves. More of the large groves remain intact in this area than in most of the other sewer districts.

District 4D is south of Brandon and S.R. 60. Much of the southern portion of the area is bordered by the Alafia River with the eastern and western boundaries roughly defined by the Community of Durant and the Brandon Airport, respectively.

The existing development in this area is south of Brandon along either side of S.R. 640. The development of 1976 totalled appproximately 1,300 acres with about 900 acres disqualified for future residential areas. Development in 1972 in the district was apparently 670 acres. Comparison with 1976 development levels indicates that an increase of 660 acres took place between 1972 and 1976. This represents a 98 percent increase in four years.

The remaining land in the district is mainly improved pasture, row crops, or forested areas located along the Alafia River.

Although only a small part of the eastern portion of the district has been strip mined, approximately one third of the total district, mainly the eastern portion, is underlain by phosphate ore.

Other significant natural features in the area include Buckhorn, Merser and Lithia Springs - all located along the Alafia River.

Total park area in District 4A of the Brandon Study Area is 37 acres. There are three neighborhood parks, the largest being 20 acres. One of the parks is associated with the sinkholes near Wimona. The existing park facility would be put under greater pressure if a population increase is induced by the prepared sewer line. Based on expected 2000 and 2020 populations existing park capacity could only accommodate 30 and 18 percent, of the increase, respectively.

Total park area in District 4B totals 63 acres. There are six parks in the area, the largest of which covers 18 acres. The capacity of these parks is 6,300 persons. With a sewer design capacity in the year 2000 and 2020 of 20,000 persons and 29,700 persons respectively, these parks will not be sufficient. (Table II-7).

There are many potential recreation areas along the Alafia River in District 4D. Urban development has not occurred in much of the area and potential use is high. Therefore, recreational demand for 2020 could be accommodated under existing park capacity. (See Table II-7).

The area of District 4A south of S.R. 60 and east of Brandon which is designated as industrial park and is presently in improved pasture is in a floodprone area. This zone is five to six square miles in area and has very little development either industrial or residential.

TABLE II-7

RECREATION RATING FOR THE YEARS 2000 AND 2020

District	Existing Park Acreage	Existing Park Capacity * (Population)	Sewer Design Capacity 2000	Sewer Design Capacity 2020	Necessary Park Acreage Needed 2000	Necessary Park Acreage Needed 2020	Existing Park Capacity by % 2000	Existing Park Capacity by % 2020
Brandon (4A)	37	3,700	12,500	21,200	125	212	30%	18%
Brandon (4B)	63	6,300	20,000	29,700	200	297	32%	21%
Brandon (4D)	214	21,400	19,800	26,600	198	266	108%	81%
Riverview-Gibsonton (5A)	20	2,000	12,500	21,400	125	214	16%	9%
Riverview-Gibsonton (5B)	122	12,200	8,500	14,700	85	147	143%	83%
Thonotosassas (3A)	56	5,600	4,700	8,800	47	88	119%	64%
Deltona (1A)	0**	0	12,000	22,000	120	220	0	0

* Assumes 10 acres necessary per 1000 persons.

** Hillsborough River State Park not included due to lack of accessibility from proposed sewer area.

This floodprone area comprises approximately 40 percent of the District 4A.

Only a very small proportion of District 4B, mainly along Mango Creek, is within the 100-year floodprone area. This flood area is south of S.R. 574.

Approximately 34 percent of District 4D is with the 100 year flood plain along the Alafia River. In addition, there are some areas near Turkey Creek which have a flood hazard potential.

The soils which are suitable for urban residential development in District 4A lie mainly along the northern boundary of the north of S.R. 574A and south of Interstate-4 and along the eastern boundary. These soils comprise approximately 30 percent of District 4A. Existing development has followed these soil patterns.

Soils with severe limitations for residential development occur north and south of S.R. 60. These low, wet soils encompass the flood prone area discussed above and extend outward from its boundaries.

The majority (90 percent) of soils in District 4B of the Brandon Study Area are suitable for residential development and citrus production, as is indicated by the extensive residential development upon former citrus groves. Areas along Mango Creek, Lake Hooker and Valrico Lake have severe limitations for residential development but are suitable for truck crops.

Approximately 60 percent of the soils in District 4D are suitable for urban development or citrus production. These areas are located south of the Brandon Airport and northeast of S.R. 640. Much of the existing urban development in the area is located on these soils.

In the Brandon Study Area, the archeological report recommends intensive survey at the proposed sewer routes along Williams Road between Highway 92 and SR 574; all routes within or bordering Section 16, T29S, R20E; the route from Seffner-Valrico Road to and along Valrico Lake; the overland route on south boundary of Section 34, T29S, R20E; and the overland route in Section 10, T30S, R20E in the vicinity of Buckhorn Creek and Alafia River.

Prehistoric sites TH2, TH3 and TH4 were identified in the vicinity of these routes. In addition, sites Hi 337 and Hi 338 have been identified in the vicinity of the proposed spray irrigation site in the southeast portion of the Brandon Study Area.

The financing risk of using connection fees and user charges for revenue generation for Brandon Sewer Districts 4A, 4B, and 4D is low. These areas are developing quickly and already have a substantial number of dwellings which would connect to the sewer. The likelihood is that the area will grow as expected.

a. Pump 9.73 MGD to Tampa (B-13)

A greater number of pipelines are required for this alternative than in alternatives that propose disposal and treatment within the study area. However, since the pipeline alignments will be originally confined to road rights-of-way and affect developed lands and pastureland, impacts are not expected to be significant. Construction activities, however, should include measures to control erosion and dewatering impacts upon adjacent plant communities.

Several plant communities, along the proposed sewer routes for District 4A of the Brandon Study Area are either sensitive or unique and should be identified. These habitats include three freshwater marshes located adjacent to the alignment. Construction should be avoided in these areas and precautions taken to prevent erosion or discharge of sediments into these wetlands. Additionally, a young cypress dome occurs adjacent to the proposed corridor along Causeway Boulevard but it is located within pastureland and is already of reduced quality. A sandhill community occurs adjacent to the pipeline alignment along Lakewood Drive. This pine-oak forest has been heavily altered, however, due to grazing and societal development. Another sensitive area occurs along a portion of Faulkenburg Road, where large live oaks are located.

The construction of 16 pump stations proposed for District 4A under Alternative (a) will affect a variety of cover types including developed lands, pasturelands, citrus groves, and shrub and forest lands. Potentially significant impacts may occur at five of these proposed locations. The pump station on Woodbury Road is located in the vicinity of a freshwater marsh. Relocation of this station to the adjacent upland community, preferrably pastureland, would reduce impacts at this site. Two proposed pump stations, one on Williams Road and one at the intersection of Faulkenburg Road and Brandon Avenue, are near wetlands and will require control of erosion and sedimentation. The proposed pump station along Lakeland Road is near oak-pine sandhills and relocation to citrus groves on the east side of the road would reduce impacts on the sandhill community. Along proposed pipeline on Faulkenburg Road, precautions will be required to reduce damage or loss of large live oaks. The pipelines proposed for District 4B of the

Brandon Study Area, under Alternative (a), are primarily along road rights-of-way and adjacent to developed lands and pastures. Development has been more intensive within this district than in Districts 4A or 4D. The original vegetation has been removed or disturbed.

There are several plant communities adjacent to the proposed pipeline route that are either sensitive or unique. These habitats will require protection from construction impacts. Along State Route 676, a disturbed, upland, oak-pine sandhill community occurs. There are also numerous tracts of large trees, primarily live oaks, adjacent to the proposed corridor, particularly along State Route 676, Lithia Road, Brandon Boulevard, and Parsons Avenue.

Construction of 17 pump stations will be required within this district of the Brandon Study Area under Alternative (a). Cover types in the general vicinity of the proposed pump stations include developed lands, pastureland, citrus groves, shrub land, and cleared land. Three of the proposed pump stations are located near wetlands and will require control of erosion, sedimentation and dewatering to protect these sensitive habitats. The locations proposed for these three stations are Windhorst Road, Taylor Road, and near Valrico Lake. In addition, a highly disrupted, oak-pine sandhill community occurs at a proposed pump station along State Route 676. Relocation of these pump stations to nearby developed lands or disturbed, less sensitive communities would reduce impacts on these habitats.

Four pump stations are proposed for areas which contain large live oak trees. The locations of these stations are on Pine Street, State Road 676, Parsons Avenue, and Brandon Road.

Alternative (a) in which the sewage for Brandon is piped to Tampa includes much less pipeline construction for District 4D than proposed for the other alternatives. The proposed pipeline for this district will generally follow road rights-of-way. Common plant cover types adjacent to the proposed alignment are developed lands and pastureland. Both of these habitats contain highly altered plant communities that are regionally common and have reduced sensitivity to environmental disturbances. Several sensitive or unique plant communities occur along these proposed corridors within the Brandon Study Area. In addition, construction impacts should be prevented from affecting the numerous small isolated wetlands that occur throughout the area.

One of the sensitive habitats, an oak-pine sandhill community, has been reported near the termination of the proposed pipeline along Lithia Pinecrest Road (Lamonte-Shumberg, 1974). Identification and marking of this habitat is necessary to avoid construction impacts to this feature. Two large live oak trees present on a section of Bloomingdale Avenue should also be identified and avoided during construction.

Construction of 12 pump stations are proposed in District 4D by Alternative (a). Vegetation cover types near these stations include developed lands, pasturelands, citrus groves, shrublands, old field and forest lands. The specific location of stations should be made in altered or early successional upland communities such as developed lands, old field or shrubland. The pump station along Kings Avenue includes numerous, small wetlands which can be avoided by locating this station in a nearby upland site. Oak-pine sandhills have been identified near the pump station at the end of the proposed pipeline on Lithia Pinecrest Road (Lamonte-Shumberg, 1974) and this habitat should be protected from construction impacts. In the Brandon Study Area, six of the proposed pump stations are near drainages that lead into adjacent wetlands. Erosion control methods should be used during construction to avoid sedimentation in these wetlands.

The effects on aquatic biota of the proposed pipelines for this alternative will be primarily in numerous, unnamed canals that meander through the area, Buckorn Creek, and on several lentic (non-flowing) water bodies or lakes in the district. These lakes and canals are subject to construction impacts associated with erosion and dewatering activities. Major aquatic habitats where pipeline construction impacts are likely to occur include Woodbury Lake, Chadman Lake, Kathy Lake, and Sand Pond, in District 4A, and Lake Mead, Long Pond, Valrico Lake, Hendricks Lake, and Hickory Lake Hammock in District 4B. There are no major lakes in Subdistrict 4D near proposed pipeline construction; Buckhorn Creek will be crossed two times by the proposed pipeline in District 4D, but construction along the existing bridges should result in minimal impacts on the biota of this stream.

The construction of pump stations proposed for this alternative can result in potentially significant impacts on aquatic systems in the area, particularly where more than one pump station is proposed along the same canal. Locations where two or more pump stations are planned near aquatic ecosystems include: (1) the pump station near Faulkenburg and S.R. 574a and the pump station near Julieanne. Both of these stations are on an unnamed canal that leads to the Tampa Bypass Canal and excess sediment transport into this canal may affect the McKay Bay estuary; (2) the pump stations on either side of Hickory Hammock Lake, with potential impacts of siltation and increased turbidity; and (3) the four pump stations near Moss Laden Street, Denham Road, Westfield Street, and Bloomingdale Avenue. These stations are all near Buckhorn Creek which leads directly into the Alafia River.

The construction of this collection system required to pump to Tampa would be expected to have a small impact on air quality and to be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would be expected. The operational impacts of this system with regard to air quality and odor would be expected to be negligible.

However, there would be some operational noise from the many pumping stations in the system. The severity of this impact would depend on the proximity of residents to noise sources.

b. Pump 7.91 MGD to Tampa; Treat and Dispose 1.82 MGD Within The Brandon Study Area.

The biological impacts of this alternative would be identical to those described for Alternative (a) for Districts 4A and 4B; and almost identical to Alternative (d) for District 4D. The only exception is that a smaller treatment plant would be required for this alternative than either Alternatives (c) or (d) below, resulting in slightly reduced impacts on the terrestrial ecosystem.

The construction of this treatment system could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would be intermittent and of relatively short duration, however. Odor problems due to construction would not be expected. The operational impact of this system on the air quality would be expected to be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of some objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

i. Land Application (Slow Rate) (B-11) - Sufficient area of soils suitable for land application of secondary effluent, should be available within the Brandon Study Area to permit satisfactory operation of a treatment facility. Hydrogeologic conditions are best in the southeastern portion of the study area where thick confining beds and relatively low leakage occurs. However, in the central portions of the study area karstic conditions exist.

This karst region coincides with the Floridan aquifer recharge area and is, in addition, a zone of high transmissivity. As a result, there exists a serious potential for contamination in an area of a potentially valuable water supply. Thus, land application should not be considered on the karstic region, but may be suitable in other parts of the Brandon Study Area, especially in the southeast.

The construction of this effluent disposal alternative would be expected to have a very small impact on air quality. Construction activities would also be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of objectionable odors. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

ii. Discharge to the Alafia River (Secondary Treatment With Nitrification) (B-9) - All stream segments within the Planning Area have been classified as water quality limited. In addition, the Wilson-Grizzle Act requires all discharges to surface waters in the Tampa Bay Region require treatment in excess of secondary processes. It is anticipated that AWT will be required. Actual treatment requirements would be determined by a wasteload allocation study.

The construction of this effluent disposal system in the Brandon Study Area would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

iii. Discharge to the Alafia River (AWT) (B-10) - Although surface discharge of secondary effluent was an alternative which was considered, it is anticipated that all sewage treatment plants discharging to the Alafia River will be required to provide advanced wastewater treatment (AWT). Construction of this effluent disposal alternative would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

iv. Deep Well Injection (B-12) - The great majority of the Brandon Study Area is well inland and, therefore, less suitable for disposal by deep well injection. There is, however, a narrow coastal portion of the Brandon Study Area where a suitable injection zone may exist. A specific subsurface study to evaluate physical and chemical parameters of the hydrogeology would be necessary to adequately evaluate the environmental impact of disposal by deep well injection.

The construction of this effluent disposal alternative would have a very small impact on air quality but it would be a source of noise in the immediate vicinity of the construction site. However, these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this alternative with regard to air quality and odor would be negligible. Nevertheless, there would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

c. Pump 5.60 MGD to Tampa; Treat and Dispose of 4.13 MGD Within The Brandon Study Area

The biologic impacts of this alternative would be identical to those discussed for Alternative (a), for District 4A, and almost identical to those impacts described for Alternative (d), below, Districts 4B and 4D. The only exception would be the size of the proposed treatment plant for this alternative, resulting in slightly greater terrestrial impacts than for Alternative (b) and slightly reduced impacts on terrestrial organisms than under Alternative (d) below.

The construction of this treatment system could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would be intermittent and of relatively short duration, however. Odor problems due to construction would not be expected. The operational impact of this system on the air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of some objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

i. Land Application (Slow Rate) (B-7) - Higher application rates and more effluent would generally be less desirable for this area, thus, dependent on land availability, application of 4.13 verse 1.82 MGD of effluent may or may not be a significant problem.

Construction of this collection system in the Brandon Study Area would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to odor and noise would be negligible.

ii. Deep Well Injection (DWI) (B-8) - As stated for Alternative (b), in the Brandon Study Area there is a limited coastal portion which may be suitable for deep well injection. Higher disposal rates and greater quantities would make a suitable zone more difficult to find.

If constructed, this effluent disposal alternative would have a very small impact on air quality and be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts would be negligible. However, there would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

iii. Discharge to the Alafia River (Secondary Treatment With Nitrification) - Construction of this collection system in the Brandon Study Area would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality and noise would be negligible.

iv. Discharge to the Alafia River (AWT) (B-6) - If this alternative is selected, a wasteload allocation study will be performed by the Florida Department of Environmental Regulation to determine the minimum level of treatment allowed for the effluent discharge. Although surface discharge of secondary effluent was an alternative which was considered, it is anticipated that all sewage treatment plants discharging to the Alafia River will be required to provide advanced wastewater treatment (AWT).

The construction of this effluent disposal alternative would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

d. Treat and Dispose 9.73 MGD Within the Brandon Study Area

Under Alternative (d) sewage would be pumped to a proposed treatment plant to be constructed in District 4D. The potential impacts of this alternative on District 4A are similar to those discussed under Alternative (a) however, fewer pipelines are required for District 4A than for Alternative (a), (b), or (c) resulting in fewer sensitive areas occurring adjacent to the proposed route.

Two wetland associations occur along the pipelines proposed by this alternative. One of these wetlands comprises a small freshwater marsh located along Providence Church Road and the other wetlands habitat is a degraded cypress dome along Causeway Boulevard. Erosion and sedimentation impacts to these wetlands should be prevented.

Large live oaks may be found adjacent to the proposed pipeline corridor on Faulkenburg Road, and will require protection from damage to their trunks and root systems.

Construction of six pump stations would be required in District 4A under this alternative. This would be considerably less than the 16 required under Alternatives (a), (b), or (c). Plant cover types in the vicinity of these proposed pump stations include developed land, pastureland and forest. Under this alternative, the only proposed pump station that would encroach on a sensitive habitat would be at Faulkenburg Road and Brandon Avenue. A drainage near this proposed station flows into a forested swamp and will require protection from erosion and sedimentation.

Most of the biologic impacts associated with Alternative (d) for Sewer District 4B of the Brandon Study Area are similar to those discussed under Alternative (a). Several unusually large trees, mostly live oaks, are adjacent to the pipelines proposed under this alternative. These large trees are located along Brandon Road, East Hillsborough Avenue, and Pine Street. Construction of 16 pump stations will be required in District 4B under this alternative, and eight of these are in the vicinity of sensitive habitats, large trees, or near drainages that flow into wetlands. Impacts for most of these pump stations have been discussed for District 4B under Alternative (a). The only exceptions involve (1) the pump station under Alternative (a) on Pine Street, bordering several large live oaks, would not be required under Alternative (c); and (2) a pump station would be required for Alternative (c) at Brandon and East Hillsborough Roads, also bordered by large live oaks. Proposed pipeline construction for this alternative will be more extensive in this District than for Alternative (a). However, most of these pipelines are proposed for the Bloomingdale Development Project Area. Clearing and development in this area is occurring rapidly. Nevertheless, this project area contains extensive forested tracts along the proposed corridors. These tracts include freshwater marshes, forested swamps, oak-pine sand-hills, and rare, sand pine-scrub associations (Lamonte-Shumberg, 1974), although this latter community is not found along the proposed routes. Oak-pine sandhills and freshwater marshes are found along Bell Shoals Road and oak-pine sandhills are also present along John Moore Road. Identification and marking of these habitats can be used to reduce construction impacts. Additionally, erosion should be controlled and sediments should be prevented from entering the freshwater marshes along Bell Shoals Road. Under this alternative the proposed pipelines in this district will not extend to the oak-pine sandhill community along Route 640, discussed under Alternative (a). Impacts from construction of pump stations in this district are similar to those discussed under Alternative (a) except that the proposed pump station on Route 640, near some oak-pine sandhills, would not be constructed under this alternative for the Brandon Study Area.

A wastewater treatment plant is proposed by this alternative and will permanently displace approximately 40 acres of existing plant coverage (versus 8 acres under Alternative (b) and 16 acres under Alternative (c)). The proposed location of this treatment plant includes both citrus groves and forests, the latter investigated for the Bloomingdale Development Project (Lamonte-Shumberg, 1974). Forest associations near this proposed plant include cypress forest, oak hammocks, pine-flatwoods and bay head forests. Both the cypress and bay head forest associations should be considered wetlands. Relocation of the treatment plant closer to Bloomingdale Avenue, within the citrus groves, would reduce impacts associated with plant construction.

Wetlands can also be expected near the proposed treatment plant in this district. Regardless of the plant's location and construction activities, sedimentation and dewatering are potential impacts that may alter these wetland systems.

The pipelines proposed for this alternative, treatment and disposal of 9.73 MGD within the Brandon Study Area, affect generally the same aquatic ecosystems as in Alternative (a), with the same potential for impacts. Because of substantive changes in proposed pipeline routes in some areas, however, this alternative would result in the following differences on aquatic habitats: Chapman Lake, in District 4A would not be affected by pipeline construction and additional pipeline construction would occur near the headwaters of Buckorn Creek, in Ddistrict D. There would be no differences in aquatic impacts resulting from pipeline construction between Alternatives (a) and (d) for District 4B.

The impacts of pump station construction proposed for Alternative (d) are similar to the pump to Tampa Alternative (a), although a reduction of these impacts would result because of: (1) the lack of the pump station near Julieanne, reducing the potential construction impacts on the unnamed stream leading to the Tampa Bypass Canal; and (2) the lack of a pump station (and associated pipeline) near Chapman Lake, reducing impacts on this aquatic ecosystem.

The construction of a wastewater treatment facility for Alternative (d) can result in impacts on an unnamed lake, southeast of the proposed facility site. Construction impacts associated with this facility are similar to those described above.

Discharge of the treated effluent into the Alafia River has the potential for significantly altering the biota of this ecosystem as well as the ecology of the Hillsborough Bay estuary. Monitoring to assure water quality standards are met would be necessary. The construction of this treatment system could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would be intermittent and of relatively short duration. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

i. Land Application (Slow Rate) (B-3) - An area of as much as 1400 acres (depending on application rates) would be required for adequate land application treatment of 9.73 MGD of effluent. The siting of a treatment facility of this size in the Brandon area would be difficult.

   The construction of this effluent disposal alternative would have a very small impact on air quality. Construction activities would also be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of objectionable odors. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

ii. Deep Well Injection (B-4) - Dependent on the physical characteristics of the injection zone, 9.73 MGD of effluent could be disposed of by means of deep well injection. However, in the light of the uncertainties regarding subsurface hydrogeology of the Brandon Study Area, the chances of success are unknown.

The construction of this effluent disposal alternative would have a very small impact on air quality and would be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this alternative with regard to air quality and odor would be negligible. However, there would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

iii. Discharge to the Alafia River (B-1) (Secondary Treatment with Nitrification) - All stream segments within the Planning Area have been classified as water quality limited. As required by the Wilson-Grizzle Act, actual treatment levels will be determined by the results of a waste land allocation study.

iv. Discharge to the Alafia River (AWT) (B-2) - If this alternative for the Brandon Study Area is selected, a wasteload allocation study will be performed by the Florida Department of Environmental Regulation to determine the minimum level of treatment allowed for the effluent discharge. Although surface discharge of secondary effluent was an alternative which was considered, it is anticipated that all sewage treatment plants discharging to the Alafia River will be required to provide advanced wastewater treatment (AWT). The construction of this collection system would have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

5. Riverview/Gibsonton Study Area. The structural alternatives for the Riverview/ Gibsonton Study Area involve sewering Districts 5A and 5B and leaving unsewered Districts 5C and 5D. From the standpoint of population density, only one alternative is significant - the sewering of Districts 5A and 5B. Location of the treatment facility will not influence population density in the study area. The 201 design populations fall well within the density ranges outlined by the Horizon 2000 Plan. Table II-8 shows that the year 2000 design population does not exceed the population associated with the minimum level density and the 2020 population is well within the maximum population. Even allowing for the gross density categories,

including land unsuitable for development, does not result in the design populations exceeding the upper bound.

TABLE II-8

HORIZON 2000 PLAN POPULATION RANGE FOR GIBSONTON/RIVERVIEW DISTRICTS 5A AND 5B

District	Population Range		201 Design Population	
	Minimum[1]	Maximum[2]	2000	2020
5A	17,300	49,900	12,500	21,400
5B	15,700	72,400	8,500	14,700

Sewering Districts 5A and 5B is compatible with the Horizon 2000 Plan. These two districts are already under pressure to develop. Highways U.S. 41 and U.S. 301 form a corridor which funnel development south from Tampa. Further, the coastline of Hillsborough Bay is attractive to industry. Tampa Electric's Gannon and Big Bend Power Stations as well as several phosphate concerns are on the coast in this area. Employment opportunities exists at these facilities.

Infrastructure is present in the Riverview/Gibsonton study area but it is not as extensive as Brandon's. Roads are the primary resource. There are several elementary schools, one junior high school and one high school within the two sewer districts. However,

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1. Based upon lower density limits of land use designation.
2. Based upon upper density limits of land use designation.

shopping, medical services, and similar support services are not sufficient. As the area grows, strip development along highways U.S. 41 and U.S. 301 is likely unless proper controls are applied. So, while the interceptors will increase population density as desired in the Horizon 2000 Plan, they will also increase pressure for strip development.

It is significant to note that Districts 5A and 5B have been designated for urban transition by the Horizon 2000 Plan. This designation as well as the heavy and light industrial designations indicate a realization in the Horizon 2000 Plan that the infrastructure will have to be upgraded. Further, the density guidelines for urban transition are such that the pressure for sprawl is likely to be temporary.

District 5A has three neighborhood parks with combined areas totaling 20 acres. These parks are associated with residential development along the Alafia River. Existing park facilities are suitable for 2,000 persons but sewer design capacity is 12,500 for the year 2000 and 21,400 for the year 2020, (Table II-7). The existing park capacity will be overloaded in the future.

Nevertheless, there is ample land available within District 5A for park and recreational area development. The most significant feature which would be suitable for park development is the Alafia River but most areas along the river are slated for industrial development which would be incompatible with recreational use.

District 5B has five parks within its boundaries. Of these, one is a district park (Bullfrog Creek) covering 100 acres while the other four are small neighborhood parks covering less than nine acres each.

Total park acreage within the district is 122 acres. Existing park capacity is 12,200 persons (Table II-7). This capacity is sufficient to handle the 201 design population. In addition, undeveloped land with recreational potential exists in this area. The coastal areas may be suitable but are scheduled for preservation in the Horizon 2000 plan. They should be left in a natural state rather than being developed for recreation.

There are no soils within District 5A that do not have severe limitations for development. However, in the northwest portion of the district there are soils which have very suitable characteristics for truck crops.

Only about 10 percent of District 5B has soils which are considered suitable for development. These soils are located in a one-half mile wide strip west of Bullfrog Creek north to the Alafia River. Most of the other soils in the area are low and wet and thus have severe limitations for development. Soils suitable for truck crops are located on either side of U.S. 41.

Existing development in District 5A of the Riverview/Gibsonton Study Area occurs mainly along the Alafia River and U.S. 41. Some residential development also occurs in the vicinity of Progress Village and Riverview. Large areas along Hillsborough Bay west of U.S. 41 are heavy industrial areas.

District 5B has much of the same land use patterns as District 5A. The area along the bay has several large industrial concerns which include an electric generating station (Big Bend Plant). Strip development extends along U.S. 41 and scattered residential areas are found along secondary roads in the area. Tropical fish farms are located just south of the Alafia River. Much of the area east of U.S. 41 and south of Kemlap Road is in truck crops. This district also will be bisected by the Interstate-4 bypass.

The flood hazard potential within District 5A occurs along the Alafia River. Most of the area west of U.S. 41 is in a zone of possible flooding due to tides generated by tropical storms. These flood areas cover approximately 64 percent of the area.

The area west of U.S. 41 in Distict 5B is also subject to flooding by hurricane surge. In addition, there are areas along the Alafia River within the 100 year flood plain. In general, the area south of the Alafia River appears to be less flood prone than the area north of the river. The hurricane surge zone in District 5B is also less extensive than in District 5A. The hurricane storm surge zone and the Alafia River floodplain account for about 34 percent of District 5B's total area.

The financing risk of using connection fees and user charges for revenue generation for Riverview/Gibsonton Sewer Districts 5A and 5B will be relatively low. The area is not as developed as Brandon, nor does it seem to be developing as fast. However, proximity to heavy industry and the presence of U.S. 41, U.S. 301, and the planned I-75 mean that pressure to develop will increase. Therefore, there is little likelihood that the area will not grow as expected.

An archeological observer is recommended during pipeline excavation of the route at the Alafia River crossing on Highway 41. In addition, all treatment plant sites in land application areas and pump stations should receive intensive archeological survey once their locations are finalized.

a. Pump 5.85 MGD to Tampa (RG-6)

Requirements for this alternative include excavation of a trench for the pipeline and the construction of 12 pump stations. This corridor would be primarily restricted to areas within the more heavily-developed portions of the district. This proposed route would follow roadways and be largely located within developed lands. The remaining plant communities along this route have already been disturbed. The most abundant cover types along this route are old field and shrubland. Both habitats reflect large-scale disturbances from clearing and grazing. Additional upland cover types adjacent to the proposed route and less frequently encountered include citrus groves, pastureland, and disturbed pine flatwoods and oak communities.

The oak communities along the pipeline routes are of limited extent and are usually located in the proximity of developed residences where they receive some protection because of their aesthetic value. The pine flatwoods are also isolated within small areas and exhibit signs of disturbances such as clearing and grazing. The pine flat woods probably formed much of the original plant cover of the district but now remain only as disturbed remnants. While the proposed pipeline lies adjacent to several of these isolated and disturbed pine flatwoods, this community is not sensitive to the impacts anticipated under this alternative.

Several cover types have been identified that would be sensitive to construction along the proposed alignment. Mangrove swamps occur at several locations adjacent to the proposed alignment along U.S. Route 41. Locations of these mangroves along the route include Archie Creek, Alafia River, Bullfrog Creek, and Kitchen Brook. Saltwater marshes containing Cordgrass and/or Salt Grass also occur at Archie Creek as well as a short distance to the north of Archie Creek. Precautions should be taken during construction to avoid erosion or sedimentation from dewatering that potentially could degrade or alter these valuable wetland systems. The only other sensitive site recorded was a particularly large oak located along Riverview Drive just east of the town of Riverview. This tree should be avoided, including protection from damaging the root system during excavation. Measures that can be taken during construction to safeguard trees are presented below. Impact from construction of the pipeline will be minimal if mitigative measures are used at designated sensitive locations.

Twelve pump stations have been proposed under Alternative (a) in the Riverview/Gibsonton Study Area. Construction of these stations represents a permanent displacement of approximately one acre at each station as well as temporary displacement during construction of a larger area surrounding each pump station. The four pump stations in the south along U.S. Route 41 can be located along this highway without affecting plant communities, assuming care is taken to avoid erosion and sedimentation from dewatering. These proposed stations are located close to Kitchen Brook, Bullfrog Creek, and the Alafia River, all of which contain significant tracts of saltwater wetlands taht could be degraded by sedimentation. All remaining pump stations are proposed for developed areas, shrub and old field communities, or lands planted with grass and periodically mowed. All of these habitats represent early successional communities or have been highly altered. Where practical, small cleared lots or areas of planted and mowed grasses should be used for construction. For example, the proposed pump station in District 5A, off of 78th Street, includes both planted and periodically mowed grasses as well as portions of a large continuous shrub and palmetto-scrub plant community. It would be preferrable to select the planted grass community over the more natural shrub and palmetto plant communities.

There are almost no significant wildlife habitats in the area. The only sensitive habitats where important vertebrates are found are along the western boundary. The proposed pipeline does run through or near several areas bordered by mangroves which are utilized by important species including the mangrove water snake. Disturbance in these areas should be avoided.

Most of the proposed pipelines will cross streams in this district at existing bridges. However, construction and dewatering activities near these water bodies may impose serious siltation and turbidity impacts if adequate precautions are not taken. Streams affected by pipelines proposed for this alternative include, in addition to numerous unnamed canals, Sims Branch, Kitchen Brook, Dug Creek, Bullfrog Creek, the Alafia River, Archie Creek, and Delaney Creek. All of these streams are tidally influenced and are contiguous with the estuary of Hillsborough Bay. Therefore, each of these streams is probably of considerable importance to reproducing stages of many important fish and shellfish. All but two of these streams (Sims Branch and Delaney Creek) pass through and/or empty into marsh grass and mangrove habitats. The impacts of increased siltation and turbidity in these areas could affect species in the food web and seriously modify the balanced community structure of these areas.

This alternative (pumping to Tampa) also includes the construction of several pump stations, most of which are near streams. Construction of pump stations where the drainage patterns could result in sedimentation in these streams would require controls sufficient to reduce these impacts. The pump stations of most concern are the four placed near the Alafia River, two on Bullfrog Creek, one near Kitchen Bay, and one near the unnamed creek at the intersection of S.R. 646 and Highway 41.

The construction of the collection system for Alternative (a) in the Riverview/Gibsonton Study Area would have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

b. Pump 2.29 MGD to Tampa; Treat and Dispose 3.56 MGD Within the Riverview/Gibsonton Study Area

Under this alternative, in addition to the pipelines described under (a), above, 10 pump stations and treatment plant would also be constructed. The same sensitive areas identified for Alternative (a), above, would occur for this proposed alignment. Several short segments along U.S. Route 41 will not require excavation for a pipeline including one at the crossing of the Alafia River, reducing the potential for sediment discharge into the Alafia River. Additional requirements under this alternative would be an additional pipeline between U.S. Route 41 and North Street, in District 5B, and a pipeline crossing of Bullfrog Creek near the end of North Street.

The proposed pipeline between U.S. 41 and North Street would generally traverse farmland and some shrub and forest habitats rather than road rights-of-way. The shrub and forest habitats in this area are continuous with a much larger, undeveloped tract of land to the south. Since the proposed pipeline would bisect only northern areas of this tract, adjacent to residential developments, impacts on these habitats should be minimal. A pipeline crossing of Bullfrog Creek will also be required under Alternative (b) and mitigative measures would be required to prevent dewatering sediments from entering this creek and affecting the numerous wetlands found downstream.

Alternative (b) would require construction of all pump stations discussed under Alternative (a), above, with the exception of the station near the intersection of U.S. Route 41 and Symes Road, which would be eliminated, and the station to be located at the end of North Street near Bullfrog Creek, which would be replaced by a treatment plant. The elimination of the station at U. S. 41 and Symes Road would preclude potential impacts of erosion and sediment runoff into the nearby saltwater wetlands along Kitchen Brook.

The treatment plant proposed for this alternative would be located within an old field at the end of North Street, adjacent to Bullfrog Creek. Approximately 15 acres of old field habitat would be displaced by the facility, but this plant community represents an early stage of plant succession that is common to the region. Additionally, the old field community is isolated within a highly developed portion of the district and probably receives considerable human disturbance.

The impacts of Alternative (b) on vertebrates in this district of the River/Gibsonton Study Area would be the same as Alternative (a), above, except for the effects attributed to construction of the treatment plant. The proposed site for this plant is an old, wet field. This area supports not only a large amphibian population but also a good population of rodents. As such, it is an important food source for many animals and the development of the area for a treatment plant would probably impact most resident vertebrates. This field is surrounded on most sides by tropical fish farms, however, which support a substantial amphibian population. Thus, the development of the treatment plant nearby will decrease vertebrate populations but will not eliminate all suitable habitats for them.

The proposed pipelines, and associated impacts on aquatic ecosystems, for Alternative (b) are similar to those of Alternative (a), with the exceptions of Dug Creek and the Alafia River. Since these two streams will not be crossed by pipelines, Alternative (b) will result in reduced impacts on these two aquatic ecosystems. A potentially significant impact may result, however, from the construction of a pipeline at Bullfrog Creek to transport wastewater to the treatment facility proposed at the end of Lena Road, on Bullfrog Creek. Since no existing construction, such as a bridge, crosses the creek at this point, significant impacts associated with pipeline construction nearby could include increased turbidity, release of toxic substances from the stream sediments, and transport of silt downsteam. These changes in water quality could result in significant changes in community structure in the stream and affect recreational fishing downstream. These impacts, however, would be temporary and mitigation is possible by using dredging procedures that will reduce sediment transport or by construction of the pipeline over the stream.

In the Riverview/Gibsonton Study Area, the pump stations proposed for Alternative (b), and their associated impacts, would be identical to those considered in Alternative (a) except that the pump station near Bullfrog Creek at the end of Lena Road would be replaced by a sewage treatment facility.

The construction of a treatment facility, as proposed for Alternative (b), can result in significant impacts, including increasing turbidity and siltation, affecting phytoplankton productivity and affecting benthic macroinvertebrates. Most of these impacts, however, would be temporary and, with mitigation of erosion and dewatering activities, should result in short-term changes in diversity and density of important species. The operation of this facility, however, with the discharge of treated effluent into Alafia River, could result in important changes in the biology of this habitat and affect the recreational use of this system. The only area that might be considered for land application of treated effluent are the citrus groves east of the facility. The impacts associated with land application are discussed above. Some discharge of effluents into the numerous tropical fish hatcheries in the Riverview/Gibsonton Study Area might be considered, with an intermediate step to provide nutrient enrichment for plankton species suitable for growth and reproduction of some of these fish species. Careful monitoring, however, of effluent quality would be required due to the potential for substantial economic losses resulting from toxic discharges into these farms.

The construction of this treatment system in the Riverview/Gibsonton Study Area for Alternative (b) could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would be intermittent and of relatively short duration, however. Odor problems due to construction would not be expected. The operational impact of this system on the air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of some objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

i. Land Application (Slow Rate) (RG-11) - A considerable portion of the Riverview-Gibsonton Study Area is covered by soils suitable for land application of wastewater effluent. The largest single area which is not suitable for land application is along the coast where the saltwater marsh and Ruskin-Sunniland-Bradenton Soil associations are dominant. The construction of this effluent disposal alternative would have a very small impact on air quality. Construction activities would also be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of objectionable odors. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

ii. Deep Well Injection (DWI) (RG-12) - The Riverview-Gibsonton Study Area has a relatively lengthy coastline section where existing ground waters are highly mineralized. Thus, the potential for successful disposal by deep well injection is probably greater for this area than any of the other county study areas.

The construction of this effluent disposal alternative would have a very small impact on air quality and would be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this alternative with regard to air quality and odor would be negligible. However, there would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

iii. Discharge to the Alafia River (Secondary Treatment With Nitrification) (RG-8) - All stream segments within the Planning Area have been classified as water quality limited. In addition, the Wilson-Grizzle Act requires that all discharges to surface waters in the Tampa Bay Region undergo treatment in excess of secondary processes. Although surface discharge of secondary effluent was an alternative which was considered for the Riverview/Gibsonton Study Area, it is anticipated that all sewage treatment plants discharging to the Alafia River will be required to provide advanced wastewater treatment (AWT).

iv. Discharge to the Alafia River (AWT) (RG-9) - If this alternative is selected for the Riverview/Gibsonton Study Area, a wasteload allocation study will be performed by the Florida Department of Environmental Regulation to determine the minimum level of treatment allowed for the effluent discharge.

The construction of this effluent disposal alternative would have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

v. Discharge to Hillsborough Bay (AWT) (RG-10) - An analysis of the effects of AWT discharge on Hillsborough Bay is provided in Section II.4.2.b.4.1.

c. Treatment and Disposal of 5.85 MGD Within the Riverview/ Gibsonton Study Area

Pipelines required for this alternative are similar to those discussed under Alternatives (a) and (b). Although a portion of the pipeline proposed along U.S. Route 41, required in Alternative (b), will not be constructed for Alternative (c), this portion of the route is already heavily developed and no significant changes in impacts would result. A pipeline crossing of the Alafia River, however, is included under Alternative (c) and control measures would be necessary during construction to prevent sediments from entering the river and affecting wetlands vegetation downstream.

The proposed treatment plant to be constructed at the end of North Street along Bullfrog Creek will permanently displace approximately 24 acres of old field. Although a slightly smaller facility was proposed for Alternative (b), the impacts can be anticipated as similar for Alternative (c).

The impacts of Alternative (c) on vertebrate populations in the area would be the same as discussed under Alternative (b), above.

The impacts of Alternative (c) on aquatic habitats would be identical to those for Alternative (a) and (b), except that the proposed pipelines would not cross Delaney Creek, but would cross the Alafia River.

The construction of the treatment system for Alternative (c) could have a moderate impact on local dust levels depending on the size of the construction area and could also create perceptible noise levels in the immediate vicinity of the construction site. These impacts would not be expected. The operational impact of this system on the air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of some objectionable odor. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

i. Land Application (Slow Rate) (RG-4) - The proposed spray irrigation site is covered by mixed soils with the great majority covered by Leon fine sand, Pomello fine sand and St. Lucie fine sand. These moderately coarse to coarse soils are permeable and are suited for slow rate land application (SCS, 1969).

Small, localized areas of questionable or unsuitable soils exist on the site but these are not of significant size and should not pose major problems.

Of the major soil types on the site, the Leon fine sand covers the greatest portion. Leon soils are characterized by a brief duration, very shallow water table. The effect of the shallow water table over portions of the site and the influence of the minor areas of unsuitable soils can only be fully evaluated through site-specific field studies. However, the best available data indicates that the proposed site is generally suitable for land treatment of 5.65 MGD of secondary effluent.

The construction of this effluent disposal alternative would have a very small impact on air quality. Construction activities would also be a source of noise in the immediate vicinity of the construction site. These impacts would be short-term. Odor problems due to construction would not be expected. The operational impact of this system on air quality would be negligible. However, there would be some operational noise associated with the system as well as the potential for generation of objectionable odors. The severity of these impacts would depend on the proximity of residents to the noise and odor sources.

ii. Deep Well Injection (RG-5) - The location of the three proposed injection wells is in a non-potable water zone (greater than 500 mg/l TDS) within the Floridan Aquifer (Shattles, 1965). The most likely injection zone, the high transmissivity or dolomite zone, of the Avon Park limestone, occurs at a depth of approximately - 700 feet MSL in the Riverview/Gibsonton Study Area. Ground water at depths of -400 to -600 feet is reported to contain more than 1000 mg/l TDS, 250 to 500 mg/l sulfate and greater than 250 mg/l chloride in this area (Shattles, 1965). However, since the data are limited, precise water quality is not known.

This alternative would result in no significant impact on biota in the district.

The construction of this effluent disposal alternative would also have a very small impact on air quality and would be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected.

The operational impacts of this alternative with regard to air quality and odor would be some operational noise associated with the system. The severity of this impact would depend on the proximity of residents to the noise sources.

iii. Discharge to the Alafia River (Secondary Treatment With Nitrification) (RG-1) - Although surface discharge of secondary effluent was an alternative which was considered it is anticipated that all sewage treatment plants discharging to the Alafia River will be required to provide advanced wastewater treatment (AWT).

iv. Discharge to the Alafia River (AWT) - If this alternative is selected, a wasteload allocation study will be performed by the Florida Department of Environmental Regulation to determine the minimum level of treatment allowed for the effluent discharge.

The construction of this effluent disposal alternative would have a small impact on dust levels and to be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

v. Discharge to Hillsborough Bay (AWT) - An analysis of the effects of AWT discharge on Hillsborough Bay is provided in Section II.4.2.b.4.1.

d. Pump 5.85 MGD to Proposed South County Facilities

The types and degrees of biological impacts anticipated for this alternative would be identical to those discussed for Alternative (a).

The construction of this collection system would be expected to have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

e. Pump 2.29 MGD to Tampa; Pump 3.56 MGD to Proposed South County Facilities

The types and degrees of biological impacts anticipated for this alternative would be identical to those discussed for Alternative (a).

The construction of this collection system would be expected to have a small impact on dust levels and be a source of noise in the immediate vicinity of the construction site, but these impacts would be short-term. Odor problems due to construction would not be expected. The operational impacts of this system with regard to air quality, odor, and noise would be negligible.

f. Pump 2.29 MGD to Brandon Study Area; Pump 3.56 MGD to Proposed South County Facilities

The types and degrees of biological impacts anticipated for this alternative would be identical to those discussed for Alternative (a).

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APPENDIX A

A PRELIMINARY ARCHEOLOGICAL AND HISTORICAL SURVEY OF THE TAMPA-HILLSBOROUGH 201 PLAN

Prepared under contract for

Dames and Moore

by

Cultural Resource Management, Inc.
Tallahassee, Florida

James J. Miller
November 9, 1979

A Preliminary Archeological and Historical Survey of the Tampa-Hillsborough 201 Plan

INTRODUCTION

This report details methods and results of a preliminary archeological and historical study of the proposed Tampa-Hillsborough 201 Wastewater Treatment Facility. The study was conducted in October and November, 1979 by Cultural Resource Management, Inc. under contract with Dames and Moore of Atlanta.

SCOPE OF THE 201 PLAN

As presently designed, the 201 facility comprises a system of force main and gravity fed pipelines as well as a number of pump stations, regional sewage treatment plants, and spray fields. For planning purposes, the county has been divided into districts; the following were included in the study: Intergovernmental Agreement area comprising most of downtown Tampa; 1A including the Hillsborough Wildlife Management Area; 3A and 3B north of Interstate 4 in the vicinity of Lake Thonotosassa; 4A and 4B east of SR43 and including Brandon, Valrico, Mango, and Seffner; and 5A and 5B comprising the area around Riverview and Gibsonten. Line routes, plant sites, and spray fields were marked on USGS quadrangle sheets supplied by the engineer; however, not all locations are final, and some are not yet well defined.

SCOPE OF THE SURVEY

The study was planned from the beginning to be preliminary -- a first look at the project which could identify high priority areas requiring further attention. The contract called for:

1. A documented literature review of the archeological and historical resources along the line routes and potential spray irrigation areas.
2. Contact with local archeological personnel who may contribute knowledge of the area.
3. A field survey of the areas deemed as potential critical cultural resource areas.
4. A draft copy of the cultural resources report for the area.

It further stated:

> This survey is to provide information necessary to evaluate potentially significant cultural resource areas to be impacted by the sewer routing process. It is not, by the normally accepted definition, an intensive archeological survey, but rather an analysis of areas which should be intensively surveyed, and an evaluation of these areas' potential as archeological and historical sites.

It was further agreed that, within the time and budget limitations, emphasis should be placed on survey of line routes with the goal of clearing as many as possible so that later resurvey would not be required.

The first phase of the project consisted of a documentary study by Mildred L. Fryman using sources at the Florida Bureau of State Lands and Florida State University Library, and a records check for known archeological and historical sites listed in the Florida Master Site File at the Florida Division of Archives, History and Records Management. This work resulted in the identification of several possible historic sites within the study area and a distribution map of recorded sites on and near the proposed impact areas. Interviews with B. Calvin Jones at FDAHRM and Roger Grange at the University of South Florida provided some insight into prehistoric site types and locations revealed by recent, unpublished surveys. Pertinent manuscript reports (Daniels, Wisenbaker and Fryman 1979; Grange 1978) were reviewed as well.

After known site locations had been plotted on the project quad sheets, field survey was begun. Methods varied according to the intensity of anticipated impact, potential of the area for containing sites, and degree of past disturbance. Most of the line routes have been planned within existing rights-of-way and have already been disturbed by road construction as well as commercial and residential development. For the most part, these sections were surveyed by driving. Some overland or less disturbed portions were walked and limited shovel testing was carried out in the vicinity of known sites and in areas judged to have high site potential. Details of the survey are presented in the following section. Lack of time prevented intensive survey of the proposed treatment plant sites and spray fields; however, several of the latter areas were walked and received limited shovel testing.

SURVEY METHODS AND RESULTS

For convenience, the pipeline portion of the 201 Plan has been arbitrarily divided into some 26 segments. These are described below along with the type of survey each received, remarks on potential impact, and recommendations for further work. The accompanying set of quadrangle sheets shows the routes of pipelines as received from the engineer and delineates those portions of each line which require no further consideration. Other portions have been placed in one of the following categories: driving survey recommended; intensive survey recommended; archeological observer during construction recommended; and, route change recommended. All spray fields, sewage treatment plant sites, and pump stations are recommended for intensive survey once their actual locations have been more firmly decided upon. Four new prehistoric sites were located during the project. Site forms are being submitted for inclusion in the Florida Master Site File.

Line A

Quad Sheet: Wesley Chapel
Description: Dirt road from SR 581, west 2.7 miles.
Surveyed: By Randy Daniels on previous project.
Remarks: No sites known or discovered.
Recommendation: Cleared, no further survey.

LINE B

Quad Sheet: Wesley Chapel, Thonotosassa, Sulphur Springs
Description: Southwest side of right-of-way SR 581, begin at curve at southeast corner, see 12, T275, R19E, south 7.0 miles to intersection of Fletcher Avenue

Surveyed: By driving, walking, and shovel testing.

Remarks: Site 8Hi400 recorded on north side of road and west side of Trout Creek. Site 8Hi452 recorded on ridge on north side of Cypress Creek. Site 8Hi320 recorded at Cypress Pond in center Section 23, T27S, R19E. Site 8Hi103 recorded in borrow pit on south side of Cypress Creek - not in right-of way. New site recorded south side right-of-way 0.32 miles south of Trout Creek Bridge.

Recommendation: 8Hi400 could not be found by USF survey or by us despite shovel testing on all sides of bridge. 8Hi320 lithic scatter not surveyed. 8Hi452 sparsely scattered ceramic period site with flint. 8Hi103 not locatable by USF, not on right-of-way. This route between Cypress Creek and north end should have archeological observer during excavation.

Line C

Quad Sheet: Sulphur Springs, Thonotosassa

Description: Trout Creek Road from intersection with SR 581, 1.65 miles east. Paved, adjacent to power line.

Surveyed: By University of South Florida for Deltona project.

Remarks: Cleared, no further survey.

Line D

Quad Sheet: Sulphur Springs

Description: Fletcher Avenue from intersection with SR 581, east 1.75 miles, then south on paved road 1.0 mile to intersection with Fowler Avenue. Follows northern edge of USF campus.

Surveyed: Driving

Remarks: Sites 8Hi328 and 8Hi330 nearby but not on right-of-way.

Recommendation: More intensive survey recommended, especially in vicinity of sites and Cypress Creek Swamp.

Line E

Quad Sheet: Sulphur Springs

Description: 22nd Street from intersection with Atlantic Boulevard, north 1.0 mile, plus two short side streets.

Surveyed: Driving, walking, and shovel testing.

Remarks: Residential development, pine flatwoods vegetation, roads ditched.

Recommendation: Cleared, no further survey.

Line F

Quad Sheet: Sulphur Springs

Description: Florida Avenue through Sections 1 and 12, T28S, R18E, plus side streets through residential area to Lake Carroll Cemetery.

Surveyed: Driving, walking, and shovel testing.

Remarks: Dense residential and commercial development. No nearby recorded sites. Five tests sterile.

Recommendation: Cleared, no further survey.

Line G

Quad Sheet: Sulphur Springs

Description: Kirby Street from Hillsborough River 1.7 miles west

Surveyed: By driving.

Remarks: Paved road through completely developed residential area

Recommendation: Cleared, no further survey.

Line H

Quad Sheet: Sulphur Springs

Description: Sligh Avenue from 12th Street, east to SCL Railroad.

Surveyed: By driving.

Remarks: Paved road through developed residential area.

Recommendation: Cleared, no further survey.

Line I

Quad Sheet: Sulphur Springs

Description: Yukon Avenue from 12th Street, east along Hillsborough River, then side streets to SR 580.

Surveyed: By driving, walking, shovel testing.

Remarks: 8Hi373 located near or on route at neighborhood park. Part of route along Hillsborough River.

Recommendation: Intensive survey recommended along River segment; recommend that Riverview Drive portion of route be rerouted along Yukon Drive to intersect with 40th Street, otherwise route is cleared.

Line J

Quad Sheet: Sulphur Springs, Thonotosassa

Description: Hillsborough River bank from Harney, north to Fowler Avenue

Surveyed: Not surveyed.

Remarks: Site 8Hi533 known on route; others likely.

Recommendation: Line should be omitted from project. Use Davis Road route instead.

Line K

Quad Sheet: Sulphur Springs, Tampa

Description: East Sligh Avenue from U.S. 41, west to 43rd Street, south to ___, west to 30th Street, south to Chelsea, west to 16th Street, plus side streets around Green Playground.

Surveyed: By driving.

Remarks: Commercial and residential development, vegetation indicates surface modification; road partly filled. Low potential area.

Recommendation: Cleared, no further survey.

Line L

Quad Sheet: Thonotosassa, Sulphur Springs

Description: Davis Road, south from Fowler Avenue, west on SR 580, then south on 78th Street to Harney Road, south to East Sligh Avenue, east to U.S. 301.

Surveyed: By vehicle except at Harney, by walking.

Remarks: See Field Book, pages 4-6. Residential and commercial development. Site 8Hi372 searched for by shovel tests in right of way; probably destroyed by construction. Concrete culverts on both sides SR 580 here. Harney high potential area but highly disturbed. 8Hi383 not near right-of-way.

Recommendation: More intensive survey required at Harney adjacent to Hillsborough River and in vicinity of 8Hi383 -- unless pipeline was routed along abandoned bed of SCL Railroad adjacent to Harney Road.

Line M

Quad Sheet: Thonotosassa

Description: From Highway 301, north to Fowler Avenue, south on Williams Road to Oak Grove Church, north to Pruett Road, east to SR 579. Also along Harney Road between 301 and Williams Road.

Surveyed: By driving.

Remarks: Sites 8Hi507 and 8Hi508 recorded along Harney Road in vicinity of Tampa Bypass Canal. Williams Road rural residential. Probably has high site potential adjacent to swamp.

Recommendation: Fowler Avenue and Williams Road to Harney Road cleared. Harney Road route badly disturbed but potential impact at 8Hi507 and 8Hi508 could be avoided by following SCL Railroad right of way. Rest of route along Williams Road from Harney Road to SR 579 is recommended for more intensive walking survey.

Line N

Quad Sheet: Gibsonton, Riverview

Description: Begin northwest 1/4 Section 10, T31S, R19E, east to Highway 41, then north to T30/31 line, overland east to unnamed road in Section 35, T30S, R19E, north to Symes Road.

Surveyed: By vehicle.

Remarks: 8Hi35 and 8Hi36 recorded nearby but in mangroves adjacent to "The Kitchen" on Hillsborough Bay. Overland portion not surveyed.

Recommendation: Recommend walking overland portion of route, rest can be cleared.

Line O

Quad Sheet: Gibsonton, Riverview

Description: Symes Road between Highway 301 and Highway 41 plus north on 41 one mile to Riverview Drive.

Surveyed: By vehicle.

Remarks: 8Hi524 on right-of-way; 8Hi525 slightly south. 8Hi524 disturbed by power line right-of-way. See Field Book, page 30.

Recommendation: Power line right-of-way could be used for pipeline route, otherwise this area west of Bullfrog Creek should receive foot survey and shovel tests. Rest of line can be cleared.

Line P

Quad Sheet: Gibsonton, Riverview

Description: Symes Road from intersection with Highway 301, west to Highway 41, north on Highway 41 one mile to Riverview Drive, east on Riverview Drive almost to Alafia River in Riverview, plus north-south road Sections 23, 24, 25, 26, T30S, R19E.

Surveyed: By vehicle.

Remarks: Sites 8Hi478, 8Hi21(GV), 8Hi16, 17, 18, 19, 20, 26, 71 all on or near route. East termination of Riverview Drive portion in vicinity of 8Hi21(GV). Actual end of route should be determined before survey for 8Hi21. Highway 41 portion through vicinity of 7 sites but heavily disturbed and filled. Rest of line through heavy residential and commercial development. Field Book, pages 29-30.

Recommendation: Proximity of Alafia River and recorded sites suggests need for more intensive foot survey plus archeological observer at Highway 41 river crossing.

Line Q

Quad Sheet: Tampa, Brandon, Gibsonton

Description: SR 676 from Hookers Point, east to Delaney Creek and Highway 41 from SR 676, south to Riverview Drive.

Surveyed: By vehicle.

Remarks: See Field Book, page 21. Hookers Point all fill. Low priority due to fill and highway construction activities. SR 676 deeply ditched along eastern portion. No sites recorded.

Recommendation: Cleared, no further survey.

Line R

Quad Sheet:

Description: Madison Road from Highway 41, east to subdivision. Section 1, T30S, R19E.

Surveyed: By vehicle.

Remarks: Short overland portion in Section 12, T30S, R19E not surveyed. Rest paved and developed. Madison Road -- wide right-of-way disturbed partly by powerline construction. Low priority area due to residential and commercial development.

Recommendation: Overland portion should be walked; rest can be cleared.

Line S

Quad Sheet: Tampa, Brandon

Description: From 1st Avenue, north to Broadway Avenue, SR 574 east to Orient Park, north and south on Orient Road between Highway 60 and I-4.

Survey: By vehicle.

Remarks: See Field Book, page 11. Orient Road heavy commercial and residential development, narrow right-of-way in Orient Park. Low priority. 8Hi333 near north end of route but slightly removed.

Recommendation: Cleared, no further survey.

Line T

Quad Sheet: Tampa

Description: 21st Avenue from 26th Street west to Robles Park

Survey: By vehicle.

Remarks: Low priority area due to residential and commercial development, narrow right-of-way. Robles park - no surface visibility, few large live oaks suggest clear cutting of original hammock. No elevated areas noted - appears heavily disturbed by landscaping. Site 8Hi129 is Hospital Building, in Ybor City - no impact.

Recommendation: Cleared, no further survey.

Line U

Quad Sheet: Tampa

Description: Along west side of Hillsborough River from N. Rome Avenue, south to Platt Street Bridge, with side streets and some overland.

Surveyed: By vehicle.

Remarks: Sites 8Hi241, 242, 244, 257, 292, and 310 all houses near southern end of route. No impact anticipated. Overland portions along river not surveyed, but probably disturbed and filled.

Recommendation: Unsurveyed portions should be walked and tested; rest of route cleared.

Line V

Quad Sheet: Gandy Bridge, Tampa

Description: Hines Avenue from Tampa Bay Boulevard, north 1.25 miles, east 0.25 miles, and east in vicinity of Tampa Bay School.

Surveyed: By vehicle.

Remarks: No recorded sites. Low priority, residential and commercial development. See Field Book, page 15.

Recommendation: Cleared, no further survey.

Line W

Quad Sheet: Gandy Bridge

Description: Fairoaks Avenue, Leona Street, Price Avenue, Rattlesnake area

Surveyed: By vehicle.

Remarks: See Field Book, page 17. Heavy residential and commercial development, low potential.

Recommendation: Cleared, no further survey.

Line X

Quad Sheet: Gandy Bridge, Tampa, Gibsonton, Port Tampa

Surveyed: By vehicle and on foot with testing at Bayshore Boulevard terminus.

Remarks: See Field Book, pages 17-19. No sites recorded, short overland portion from Skyview playground to Averill Road walked. Shovel test at Bayshore Boulevard and Averill. Route judged to be low potential.

Recommendation: Cleared, no further survey.

Line Y

Quad Sheet: Dover, Brandon

Description: SR 60 from Valrico to Valrico Lookout Tower, Valrico Road, Miller Road, Lithia-Pinecrest Road, Bloomingdale Road from Bellshoals Road to Pearsen Road, Pearsen Road

Surveyed: By vehicle.

Remarks: Most roads with wide rights-of-way, deep ditches. See Field Book, pages 30-33. Low potential. Sites 8Hi206-207 historic; no impact. Foot survey at Turkey Creek. No site noted.

Recommendation: Cleared, no further survey

Line Z

Quad Sheet: Brandon

Description: All routes on Brandon Quad except Lines Q, R, S, and Y.

Surveyed: By vehicle and on foot.

Remarks: See quad sheet for routes unsurveyed or judged to have high potential.

Recommendation: Intensive survey recommended for the following portions of line at Williams Road between Highway 92 and SR 574. All routes within or bordering Section 16, T29S, R20E; route from Seffner-Valrico Road to and adjacent to Valrico Lake; overland route on south border of Section 34, T29S, R20E; overland route in Section 10, T30S, R20E in vicinity of Buckhorn Creek and Alafia River.

SUMMARY OF RECOMMENDATIONS

Intensive survey is recommended for the following pipeline routes:

Line D - From intersection at north center Section 9 to southern end of route at SR 582, 1.75 miles

Line I - Along Yukon Street from 30th Street to 35th Street, 0.35 miles

Line L - Along Harney Road in vicinity of Harney and 8Hi383, 0.4 miles

Line M - Along Harney Road between Highway 301 and Williams Road unless line route follows SCL Railroad grade, 1.0 mile

Line N - Along overland portion from Highway 41 to east boundary of Section 35, 0.9 miles

Line O - Symes Road from northwest corner Section 31, across Bullfrog Creek to top of ridge, 0.8 miles

Line P - Whole route, 10 miles

Line R - Overland portion at southern end of new subdivision, Section 12, T30S, R19E, 0.6 miles

Live V - Hillsborough River portion between Albany Avenue and Hospital, 1.1 miles

Line Z - Williams Road between Highway 92 and SR 574; all routes within or bordering Section 16, T29S, R20E; route from Seffner-Valrico Road to and along Valrico Lake; overland route on south boundary of Section 34, T29S, R20E; and overland route in Section 10, T30S, R20E in vicinity of Buckhorn Creek and Alafia River.

These segments are recommended for rerouting because of anticipated impact on known sites or because they run through areas judged to have high site potential:

Line I - Riverview Drive portion should be rerouted along Yukon Drive to intersect with 40th Street.

Line J - Route adjacent to river should be abandoned in favor of existing right-of-way.

Line L - Placement of Harney Road line within railroad right-of-way could avoid potential impact at 8Hi338.

Line M - Placement of Harney Road line within railroad right-of-way could avoid potential impact at 8Hi507 and 8Hi508.

An archeological observer is recommended during pipeline excavation of two route segments:

Line B - From northern terminus along SR 581 to the west boundary of Section 4, T28S, R19E.

Line P - Alafia River crossing on Highway 41.

All other portions of the pipeline system can be cleared with respect to impact on cultural resources. As already mentioned, all treatment plant sites, spray fields, and pump stations should receive intensive survey after their locations are made final.